

Railway Maintenance Engineer

CHICAGO

NEW YORK

SEPTEMBER, 1917

CLEVELAND

WASHINGTON



For War Time Stress and Strain

War time traffic brooks no delays! Every foot of track must do its bit in this war for democracy. Look to your tracks; above all, look to your guard rails and guard rail clamps—these are vital factors in this drive for speed and safety.

READING GUARD RAIL CLAMPS

will meet the stress and strain of war time traffic. Made of special heat-treated cast steel, the Reading Clamp is the only rail clamp with filler block and wedge of same quality of metal as the yoke. Yoke is so designed that metal is distributed to points where greatest strain will come.

The wide end construction of yoke prevents clamp from slipping from its right angle position to the rail. In service, the flexible swing movement of the Reading Clamp acts as a shock absorber—eliminates strain on yoke, and, to a great extent, the pulling in of stock rail at this point.

Remember, the READING CLAMP can be applied without pulling any spikes or moving guard rail from its original position.

Manufactured in three sizes, while filler blocks are furnished according to the section of rail to which clamp will be attached. Facts, figures and photographs on request.

Manufactured and Sold by

The Reading Specialties Co.
Reading, Penna.

Manufacturers of Guard Rail Clamps, Rail Benders, Tie Spacers, and Compromise Joints

BRANCH OFFICES

111 Broadway, N. Y.
747 Railway Exch., Chicago, Ill.
4th National Bank Bldg., Atlanta, Ga.

BRANCH OFFICES

1st National Bank Bldg., Denver, Colo.
932 Oliver Bldg., Pittsburgh, Pa.
H. W. Hellman Bldg., Los Angeles, Cal.
Colorado Bldg., Washington, D. C.





RAMAPO

Ramapo Iron Works

**Automatic Safety Switch
Stands are Manufac-
tured only by the**

Write for Descriptive Catalogues on
Switch Stands, Switches, Frogs, Guard
Rail Clamps, Etc.

Manganese Track Work a Specialty.

Ramapo Iron Works Main Office:
WORKS: Hillburn, N. Y., and Niagara Falls, N. Y.



THE P. & M.

RAIL ANTI-CREEPERS

**EFFECTIVE — EFFICIENT
UNIVERSALLY USED**

THE P. & M. CO.

RAILWAY EXCHANGE
CHICAGO

NEW YORK SAN FRANCISCO
ST. PAUL DENVER



THE VAUGHAN

ESTABLISHED 1882

THE WEIR FROG CO.

*Track Work of Rail and
Manganese Steel Construction*



CINCINNATI --- --- --- --- --- OHIO

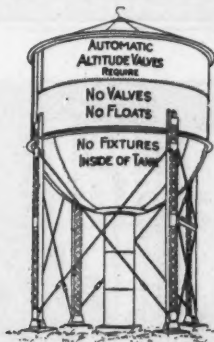
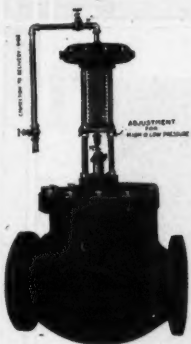
STEAM railroads are recognizing more and more the importance of a good grade of special track work, including under this term switches, frogs, guard rails, crossings (either rigid or with movable points), single and double slips, cross-overs, turn-outs, curves and complex layouts and their parts. New installa-

NO doubt as a progressive Maintenance of Way Engineer this subject is of the utmost importance and you are seeking all possible information concerning the problem.

Our 127 page treatise on frogs, crossings, switches and stands will without doubt prove of service in this connection. May we place it on your desk?

THE CINCINNATI FROG & SWITCH CO.
Manufacturers of Track Equipment of Merit for Steam and Electric Railroads, Mines and Mills
CINCINNATI OHIO



Keep a Uniform Stage of Water in Your Standpipe

Stop wasting water and keep a constant head on your distribution system by equipping all reservoirs, stand pipes and tanks with

GOLDEN-ANDERSON

Automatic-Cushioned Controlling Altitude Valve

- 1.—Insure uninterrupted service and a positive water supply at all times.
- 2.—Prevent waste down the overflow.
- 3.—Contain no floats, fixtures.
- 4.—Absolutely cushioned by both water and air in opening and closing. No banging, water hammer or burst mains.

- 5.—Can be opened and closed from distant points by simple electric solenoid attachment.

- 6.—Can be made to work both ways to close automatically on a single pipe line in case of a break.

- 7.—Heavy construction throughout.

GOLDEN-ANDERSON

Automatic-Cushioned Water Pressure Reducing Valves

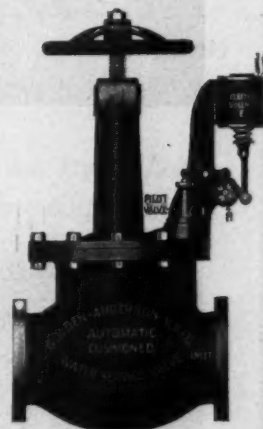
- 1.—Maintain a constant terminal water pressure under all conditions.
- 2.—Positively cushioned by water and air in opening and closing.
- 3.—Valve closes slowly, eliminating all shock and water hammer.
- 4.—Can be furnished with electric feature for emergency closure from distant points.

GOLDEN-ANDERSON

Cushioned Water Service Valve

"FOR FIRE SERVICE"

- 1.—Can be opened and closed instantly from distant points by electricity.
- 2.—Current is on only a few seconds, thereby preventing waste.
- 3.—Can be fitted with either d.c. or a.c. solenoid.
- 4.—Perfectly cushioned by water and air. Positively no metal to metal seating.
- 5.—Can be closed by hand.



"HOSTS OF REFERENCES"

Golden-Anderson Valve Specialty Company

1200 Fulton Bldg. Water and Steam Specialties Pittsburgh, Penna.



Capacity 50,000 Gals. Height 20 Ft. to Bottom
Chicago & Northwestern Ry.

STEEL TANKS For RAILWAY SERVICE

Build For The Future

The Corporations which show the most enviable dividend record over a period of years are those which have followed this policy.

A Steel Tank Is An Asset That Does
Credit To Your Judgment

Chicago Bridge & Iron Works

SALES OFFICES

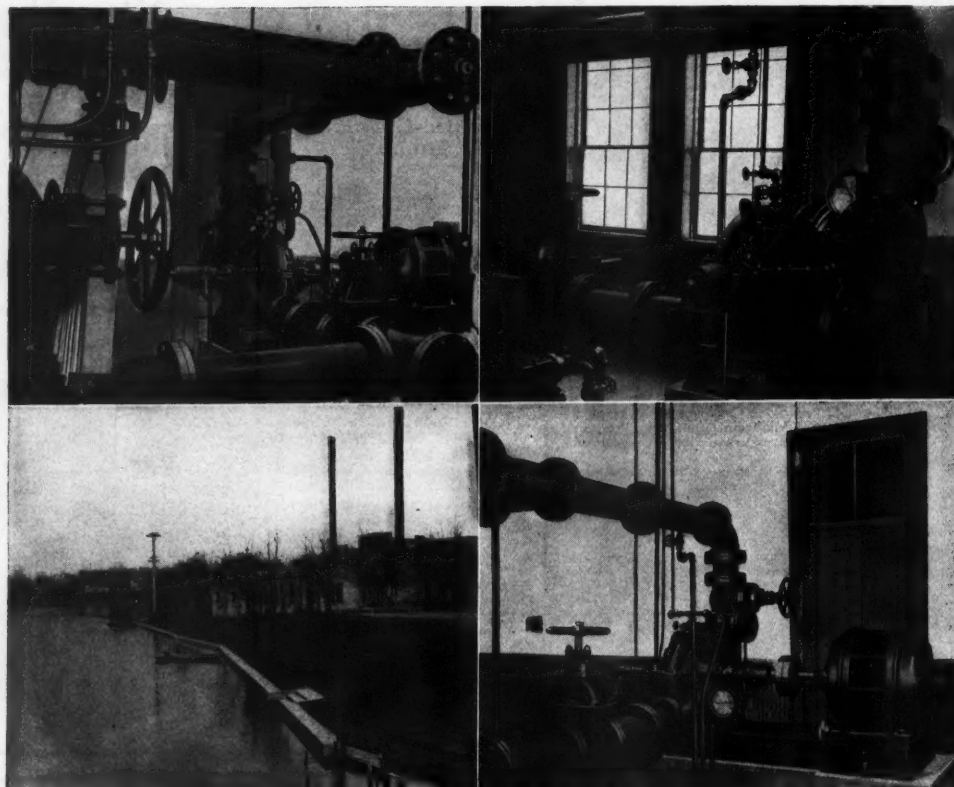
Chicago, Ill.
New York, N. Y.
Dallas, Tex.
Jacksonville, Fla.
Detroit, Mich.
Havana, Cuba

Charlotte, N. C.
Salt Lake City, Utah
Seattle, Wash.
Los Angeles, Cal.
San Francisco, Cal.
Bridgeburg, Ont.

SHOPS

Eastern: Greenville, Pa.
Central: Chicago, Ill.
Canadian: Bridgeburg, Ont.

CABLE ADDRESS
"Chibridge Chicago"



Pump Quality That Commands Repeat Orders

There can be no better indication of pump quality than the installation of a pump in a large water-works plant that shows so much greater economy of operation than the pumps in use, that within a few months a repeat order is placed for a duplicate unit.

This is the experience of the Water and Light Commission at Fort Atkinson, Wisconsin. They had been pumping by steam but were able to get a low rate for electricity transmitted from Milwaukee.

They purchased for the new unit an "American" 4-inch type DSMD, single-stage, split shell, enclosed impeller, completely bronze fitted centrifugal pump, designed to deliver one million gallons per day against a total head of 175 feet at 1750 R.P.M., driven by a 40 H.P., 3 phase, 60 cycle, 2200 volt General Electric motor.

Exterior and interior views of this installation are shown in accompanying illustrations.

Water is obtained from a deep well located in the middle of a circular reservoir. This well flows into this and two rectangular reservoirs for storage. The pump takes its suction from a 12-inch main supplied by the three reservoirs. Its regular operation is drawing a 17-inch vacuum and delivering against 65 lb. pressure into a 12-inch main leading to the city. A large elevated steel tank floats on the system of mains.

The average of two acceptance tests of this unit showed an overall efficiency of 68 per cent. The Commissioners were so well pleased with the installation that an order was immediately given for another similar "American" pumping unit to be placed about 4,000 feet from the main pumping station and operated under remote control.

The prestige of "American" centrifugal pumps is due to the fact that they possess the quality that commands repeat orders.

Catalog 149 describes them. Write for it.

The American Well Works

General Office and Works: Aurora, Ill.
Chicago Office: First National Bank Bldg.

Sales Agencies:

New York City
Philadelphia, Pa.
Pittsburgh, Pa.
St. Louis, Mo.
St. Paul, Minn.

Dallas, Texas
Birmingham, Ala.
Kansas City, Mo.
Joplin, Mo.
Lincoln, Nebr.

Denver, Colo.
San Francisco, Cal.
Salt Lake City, Utah
Los Angeles, Cal.
Artesia, New Mexico

Edmonton, Alta.
Calgary, Alta.
Chatham, Ont., Can.
Montreal, Que.

The Solution for One of the Most Difficult Track Problems

INTERNATIONAL STEEL CROSSING FOUNDATIONS

Crossing frog maintenance and renewals are the bane of the railway maintenance department. Racking on the unstable foundations furnished by any arrangement of wooden ties is the principal cause of this condition. Crossing frogs are continually out of line and surface. Bolt and filler block breakages soon wreck perfectly good crossing frogs.

A unit bearing on a ruggedly built steel foundation obviates these difficulties.

The steel foundation furnishes a large spread bearing that bridges the soft spots in the ballast and supports the joints. The steel bearing absolutely prevents movement between the members forming the frog.

Isn't this the answer to your particular difficulties? Why put off the day of determining for yourself what many others know from experience. Let us prove our claims to your satisfaction.

The International Steel Tie Company

Manufacturers of Steel Twin Ties and Crossing Foundations

General Sales Office and Works: Cleveland, Ohio

REPRESENTATIVES

Western Eng'g Sales Co.,
Los Angeles, Cal.

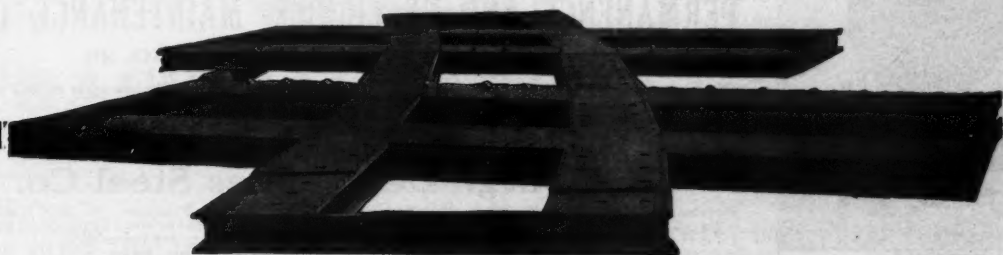
San Francisco, Cal.
Seattle, Wash.

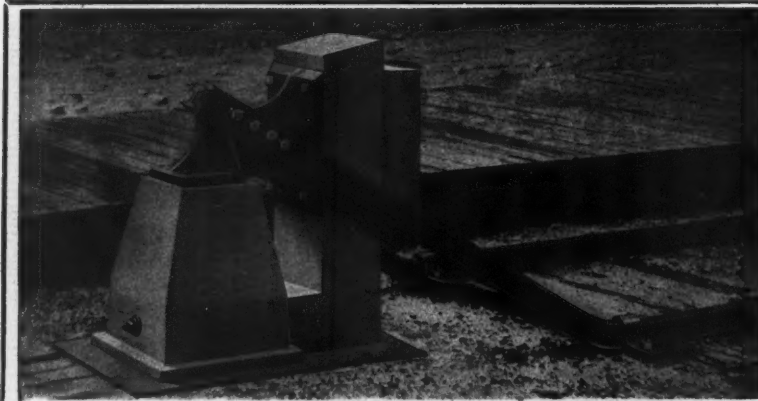
R. J. Cooper Co.,
Salt Lake City, Utah

J. E. Lewis & Co.
Dallas, Texas.

Maurice Joy,
Philadelphia.

William H. Ziegler,
Minneapolis, Minn.

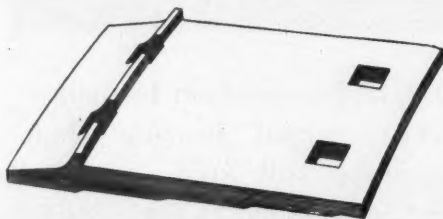




ELLIS PATENT Bumping Post

Simple, Strong and Lasting
Adapted to All Positions

Mechanical Manufacturing Co.
Chicago, Ill.



THE LUNDIE TIE PLATE

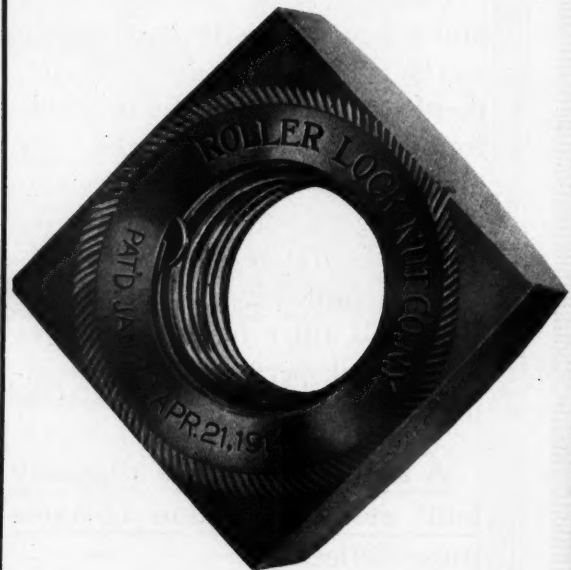
The Lundie Tie Plate is widely acknowledged by railroad men having such plates in track, as promoting decided economy in rail wear, in holding track to gauge and in giving easy riding track. It will far more than pay for itself in reduction of Operating Expenses.

The features of the plate are—a sloping seat inclining the rail, so reducing abrasion and internal stresses in the rail to a minimum—a true camber promoting easy riding—and a bottom, as shown in the cut, so seating itself on the tie that the track is held firmly to gauge without injury to the tie.

The combination of these features, or their mechanical equivalent, is covered by Letters Patent, supported by other Patents covering certain individual features of the plate. Railroad companies pay no royalties on its authorized use.

The undersigned, as the original promoter of the principles embodied in the Lundie Tie Plate, offers plates for sale in fair competition with any other plate in the market, depending on its proven merits for its extended use.

JOHN LUNDIE, 52 Broadway, NEW YORK



Capacity, 60,000 gallons. Height, 36 ft. 8 in. to top.

STEEL RAILWAY SERVICE TANKS

FOR

PERMANENCE AND NEGLIGIBLE MAINTENANCE COST

WRITE FOR RAILWAY BOOKLET NO. 28

We manufacture and erect Elevated Steel Tanks and Standpipes for every service

Des Moines Bridge & Iron Co.

Des Moines, Iowa, 912 Tuttle St.

Pittsburgh-Des Moines Steel Co.

Pittsburgh, Pa., 920 Curry Building. New York City, 55 Church St. San Francisco, Cal., 5000 Rialto Building. Chicago, Ill., 1290 First National Bank Bldg. Havana, Cuba, Room 165 Nova Scotia Bank Building. Dallas, Texas, 1285 Praetorian Building. Chatham, Ont., 299 Innes Ave.

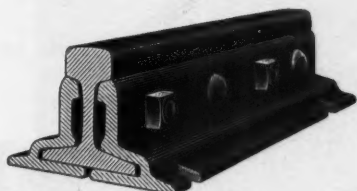
Plants—Pittsburgh, Pa. Des Moines, Ia. Chatham, Ont.

The Rail Joint Co.

GENERAL OFFICES:

61 Broadway

New York City



Continuous Rail Joint

Makers of Continuous, Weber, Wolhaupter and 100% rail joints.

Standard—Insulated—Step—Frog and Switch Types.

Grand Prize San Francisco.
1915

Protected by Patents

Work In The Trenches—

is made easier by using "Toledos" on the threading jobs.

Always ready for action, "Toledo" Pipe Threaders are daily doing thousands of the most difficult threading jobs imaginable.

Simple, portable and efficient, "Toledos" will produce the results you are looking for.

There's a jobber near you who has them in stock for immediate delivery. Ask us for his name and your copy of the "Toledo Hand Book."

The Toledo Pipe Threading Machine Co.
Toledo, Ohio
50 Church St.
New York Office
369 Hudson Terminal



TRACK JACKS

For constructing, surfacing, ballasting and repairing railroad track, Barrett Track Jacks are the recognized standard tools used by practically all railroads. They conform strictly to the requirements of the Roadmasters Association of America, are quick acting, positive, and durable. Manufactured in a large number of sizes, they are adapted to every condition. Made in both single and double acting types. Send for 150-page illustrated catalog.

THE DUFF MFG. CO.,
Established 1883
Pittsburgh, Penna.
New York Chicago Atlanta St. Paul San Francisco



Low Maintenance Cost

easy installation and longer service dictate the use of

STEWART'S
IRON FENCE
"The Standard of the World"

for all work at stations or within switching limits for intertrack fence, right-of-way fence and concourse enclosures.

Stewart fence and gates are built to meet your particular problem in handling crowds, protecting property and preventing damage suits.

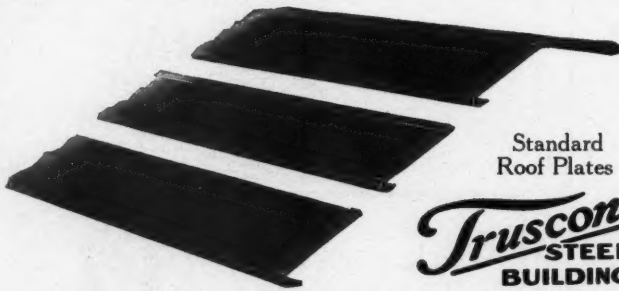
Scientifically designed. Last a lifetime.

Experience records of leading roads prove Stewart fence the cheapest and best protection in the long run. Write for catalog. State your problem and get the facts.

Iron and wire window guards, wire partitions for baggage rooms, store houses and tool rooms.

THE STEWART IRON WORKS COMPANY, Inc.
700 Stewart Block
Cincinnati, Ohio

"The World's Greatest Iron Fence Builders"

Standard
Roof PlatesWeather-Tight Joint
at Eaves

Truscon Steel Trusses

All in Sight and Easily Assembled

Aladdin conjured up no more wonderful structure than the Truscon Steel Buildings on the sectional unit system. Two men with hammers can erect them. There are no holes to punch, no rivets to drive, no wires to tie. The T-bolt and wedge make a rigid connection everywhere.

Fireproof, watertight, with nothing about them to decay or wear out, these buildings are practically everlasting. Do not confuse them with the cheap, light type wired or bolted together—Truscon construction is in a class by itself.

Yet they are flexible. Truscon Steel Buildings may be readily enlarged by the addition of panels. They may be taken down at little expense and re-erected without impairing their strength or appearance.

Consider the economy of such a construction. It is permanent, yet portable. The cost for up-keep and repairs is negligible. Fire danger is eliminated, and a building which will suit your requirements is assured.

For railroad uses the superiority and economy of Truscon Steel Buildings are self-evident. Write for our Railroad Booklet.

TRUSSED CONCRETE STEEL COMPANY

Representatives in Principal Cities

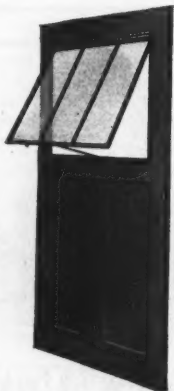
Railroad Department, Youngstown, Ohio



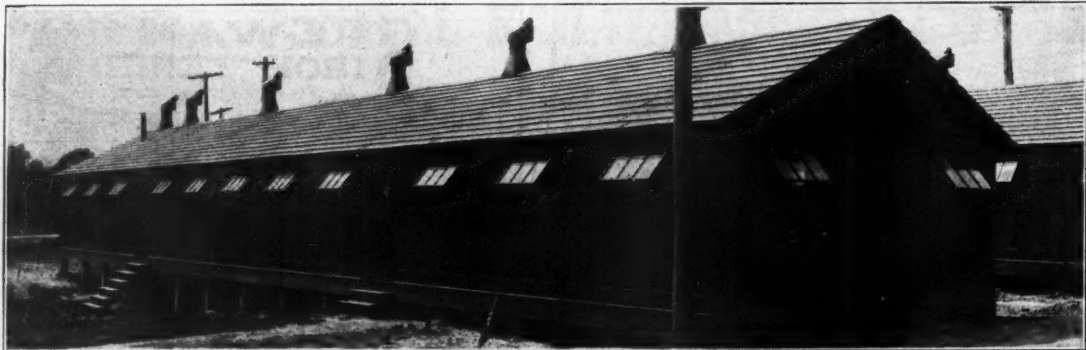
Solid Side Panel

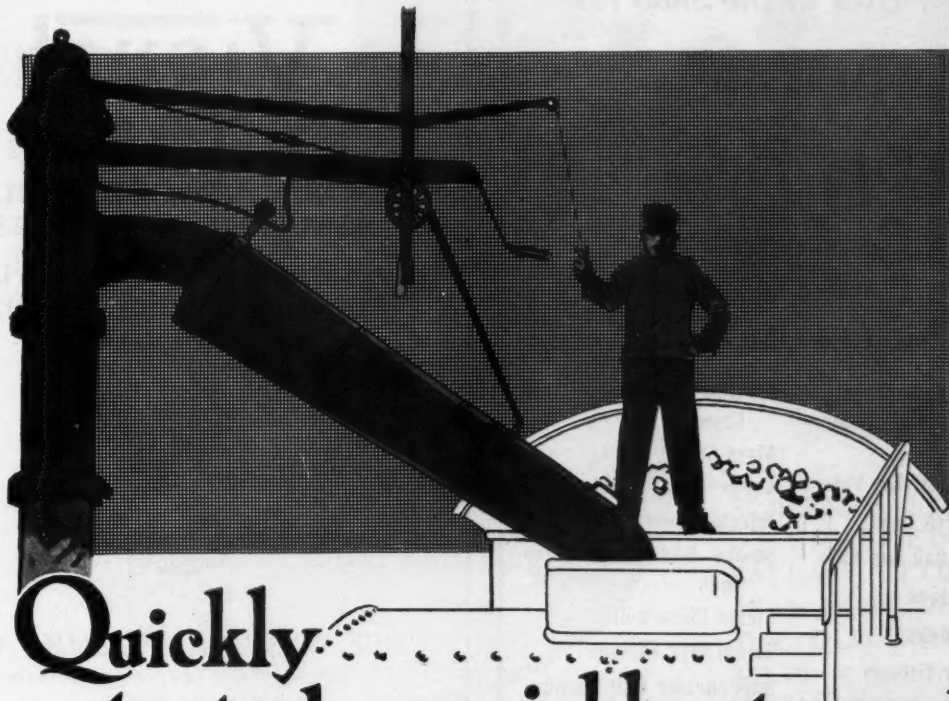


Corner Panel



Sash Side Panel

Solid Panel
Single Door



Quickly... started — quickly stopped an efficient water column **THE POAGE STYLE "H" with FENNER DROP SPOUT**

You want a water column that can be adjusted quickly without spotting the tender.

One that you can use with tenders of different heights.

One that can be shut off quickly without causing water hammer that injures the mains.

One that does not leak and waste water and become weighted with ice in winter.

One that will not be knocked over by an unexpected shift of the tender.

IN THE POAGE STYLE H

you can have such a water column. The spout has a vertical range of five feet and will reach tenders of any height. It has a lateral range of three feet which enables it to move to meet the tender. The open telescopic joint is not packed, yet it does not leak or waste a drop of water.

The valve shuts off quickly—85 per cent almost instantly and 15 per cent more slowly—the scientifically correct principle to secure quick closure without danger to the mains.

Write for the results of the University of Illinois tests.

Manufactured exclusively by

THE AMERICAN VALVE & METER COMPANY
CINCINNATI, OHIO



Uses in the Shop for

DIXON'S Graphite Pipe Joint Compound

FOR LOCOMOTIVES

Air Pumpheads, Tops, Bottoms and Center- plates	Flexible Stay Bolt Nut Caps
Air Pump Starting Valves	Glass Gauge Valves
Boiler Check Caps	Gauge Cocks
Bolts thru Oak End Sills	Injector Steam Pipes
Blower Valves	Smoke Box Bolts, Front Ends
Blowout Cocks	Steam Chest Bolts
Cold Water Fittings	Steam Pipe Fittings
Cylinder Head Studs and Joints	Superheater Unit Con- nections
Dome Cap Bolts and Joints	Surface Cocks
Facing Gaskets	Washout Boiler Plugs and Plates

MISCELLANEOUS USES

Hydraulic Jacks	Ram Plugs
Pipe Fittings, Passenger Cars	Regulating Valves
Radiator, Air and Steam	Steam End Valves

DIRECTIONS

For pipe joints, apply with a brush or swab. For bolts and screws it is better to use a swab where possible and smear the Compound around in the hole, as then the bolt or screw receives a better coating.

Stir well before using. If the package is kept open and unused, cover the surface of the Compound with oil or water to prevent drying. Then, should lumps occur, soften by the addition of linseed oil.

Dixon's Graphite Pipe Joint Compound makes tighter joints for steam, water, air and oil piping than any other material. It resists heat, cold, acids and alkalis and protects the threads from corrosion of every sort. It never "sets" as red lead; joints may be opened at any time with ease, and without injury to pipe, fittings or tools.

Send for Booklet No. 187-D.

Made in JERSEY CITY, N. J., by the
JOSEPH DIXON CRUCIBLE COMPANY
Established 1827

SHERWIN-WILLIAMS

Visual Red

**FOR CABOOSES AND
SEMAPHORE BLADES**

**Permanent—Solid Covering—
Sharp and Bright—Visible
at Long Distance**

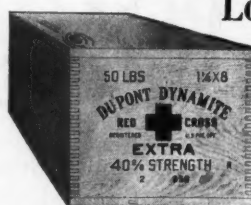


THE SHERWIN-WILLIAMS CO.

Railway Paint and Varnish Makers

Address Inquiries to

798 Canal Road, N. W. CLEVELAND, OHIO



**Load Bore Holes
With
Red Cross
Extra**

**The
Universal Explosive**

Red Cross Extra Dynamite is a **LOW FREEZING**, all-the-year-round, high efficiency explosive especially

Adapted to Contracting

It is made in all standard strengths from 20 to 60% and guaranteed to be as represented by cartridge markings.

Red Cross Extra Dynamites are as strong, stable and efficient as any other standard explosive.

If no test of Red Cross Extra has been made, make one at once—it is the least expensive and most efficient explosive.

Tell us what your blasting work is. Let us suggest efficient and economical ways to use Red Cross Explosives.

E. I. du Pont de Nemours & Co.

Wilmington, Del.

POWDER MAKERS

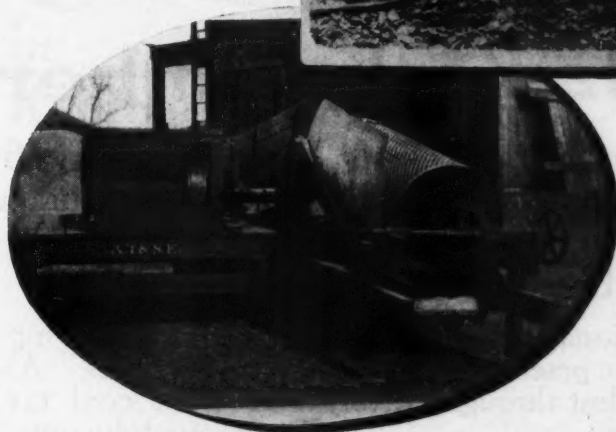
SINCE 1802



\$50⁰⁰
PER DAY
SAVED
By One Gang



The Harris-Muff Ballast Screening Machine in Operation.



**SCREENED 1,700 FEET
 OF CRUSHED ROCK
 BALLAST IN ONE DAY
 AT A COST OF \$17.50.
 THE OLD WAY COST
 \$67.50.**

The FAIRMONT "Makes Good" On A New Job—Read The Letter

Chapman, Kans., July 21, 1917.

Fairmont Gas Engine & Railway Motor Car Co.,
 Fairmont, Minn.

Dear Sirs:—I am enclosing two photos of a track screening machine I patented and which my FAIRMONT engine is running.

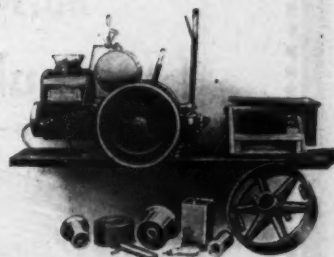
Recently I ran the machine all one day (TEN HOURS) WITHOUT A STOP on four gallons of gasoline. In this time the machine screened 1,700 ft. of crushed rock ballast at a total cost of only \$17.50. Another gang (working without the machine) only screened 1,400 ft. at a cost of \$67.50 for labor—just \$50.00 more than it cost to do the same work and three hundred feet besides with the machine.

I have never seen another engine on this work run for ten hours without a stop. I don't think we would have done so well without the MIGHTY FAIRMONT.

Yours truly,

(Signed) G. C. HARRIS, Sec. Foreman.

NOTE:—Mr. Harris has recently ordered his second FAIRMONT engine, having sold his first one after it had been in constant service for four years. The engine is still in good working order.



This is the little engine whose middle name is POWER

FAIRMONT GAS ENGINE & RY. MOTOR CAR CO.
 423 N. Main Street, FAIRMONT, MINNESOTA, U. S. A.

PERMANENT

It Outlasts the Timber

R-W-P-O stands for **Reilly's Wood Preservative Oil**. We believe that this product is the best on the market for open tank or brush treatment of any kind of timber.

It has an exceptionally high boiling point, hence practically none of the oil is lost through evaporation—a striking contrast to the action of other Creosote Oils.

It penetrates deeper than ordinary commercial creosote oils. And it stays in the wood.

Reilly's Improved Creosote Oil

By far the finest product ever developed for use with the empty cell process of treating timbers. Has three times as much permanent body as the next best product.
Samples on Request

Limpid and free-flowing at working temperatures. Absolutely free from coal tar or other adulterants.

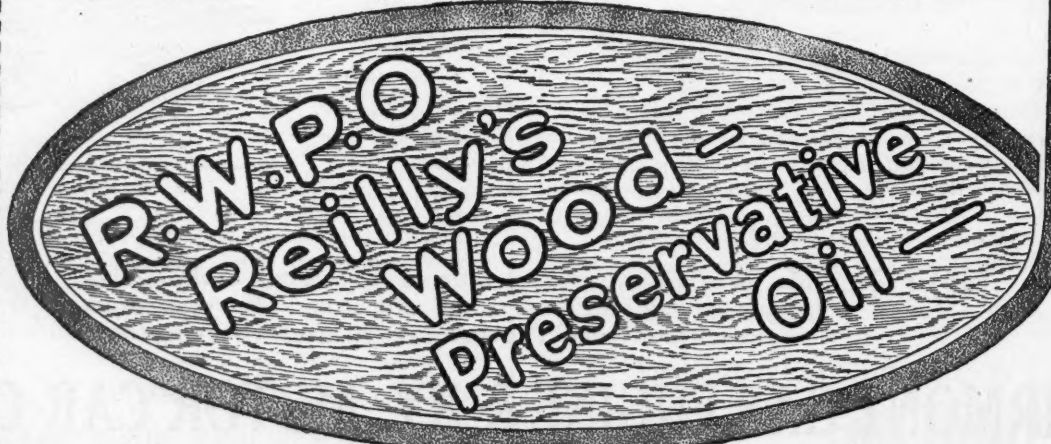
It coats the surface and fills cells and fibres with a solid mass of insoluble oil that prevents the entrance of water and destroys germ life. Insects will not attack it.

We have the goods and can make shipments
Write for prices and full particulars

Republic Creosoting Company

Plants: Indianapolis—Minneapolis—Seattle—Mobile

Indianapolis, Indiana



The CEMENT-GUN in Railroad Work

THE Cement-Gun has proved itself the gun of rational preparedness in railroad work. Railway officials realize that the Cement-Gun is the vital factor in the economical placing of cement mortars.

These men know that saving in time and money and saving from chance of destruction are assured by the use of the Cement-Gun.

Ask the Pennsylvania Railroad Engineers what was used for protecting the steel substructures of

the Cortlandt St. Ferry Terminal, New York.

Ask the N. Y. C. & H. R. RR. what they use for sealing rock cuts; and used for fireproofing the girders and columns at the Grand Central Station, New York.

Ask the Seaboard Air Line about their new erecting shop at Portsmouth, Va.

Ask the Grand Trunk Railway how they saved their bridge across the Humber River at Weston, Ont.

Ask the B. & O. RR., the P. & L. E. RR., the D. & H. RR., the B. & A. RR., the C. B. & Q. RR., how they secure saving on concrete work, and the answer will be, through

GUNITE

Shot By The Cement-Gun

Ask for the Cement-Gun booklet. Know the savings in time and money assured by

A Cement-Gun for Every Division

CEMENT-GUN CO., INC.

Allentown,

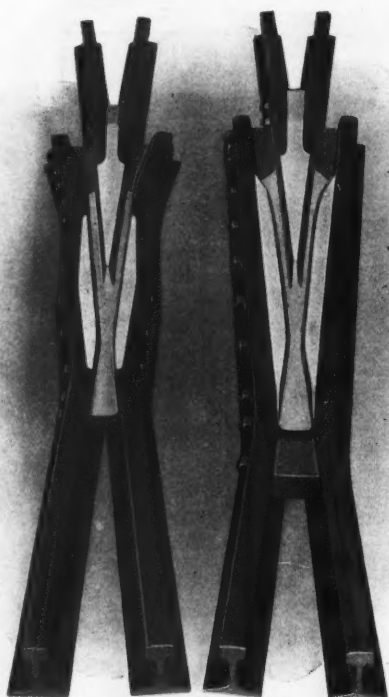
Pa.

New York Office, 30 Church Street



E. R. Ayers, 1414 Fisher Bldg., Chicago, Ill.
John A. Traylor, Newhouse Bldg., Salt Lake City, Utah.
Taylor Engineering Co., 538 Central Bldg., Seattle, Wash.
Taylor Engineering Co., Vancouver, B. C.

TISCO Manganese Steel



Wharton A-91 Frog

M.T.S. Standard Frog

Showing You How the M.T.S. Standard Rail-Bound Manganese Frog

Compares with a type of frog which has been quite popular for many years and used very extensively—our Design A-91.

Note the much more generous proportions of the Manganese Steel casting in the M.T.S. Frog; added strength through wing rails not being notched to receive casting; absence of strain on bolts due to casting containing guard flares, and more of the throat; heavier heel-block extension; general straight lines throughout, facilitating accuracy in fitting.

Adopt the M.T.S. as Standard

Detail drawings of the M.T.S. Frog, of any standard angle, from 1/4 No. 4 to No. 20, gladly furnished upon request.

Manufactured by

Wm. Wharton Jr. & Co., Incorp.
EASTON, PENNA.

Steel for Service

Under existing circumstances it is not possible to maintain Warehouse stocks in full complement. It is not possible to furnish all sizes and sections immediately.

Warehouses, however, do still contain some quantities of products, and it is possible to make good substitutions from sections now in stock.

Submit inquiries to any of the Warehouses—

Baltimore Warehouse	Baltimore, Md.
Cleveland Warehouse	Cleveland, Ohio
New England Warehouse	Boston, Mass.
Pittsburgh Warehouse	Pittsburgh, Pa.
Waverly Warehouses	Newark, N. J.

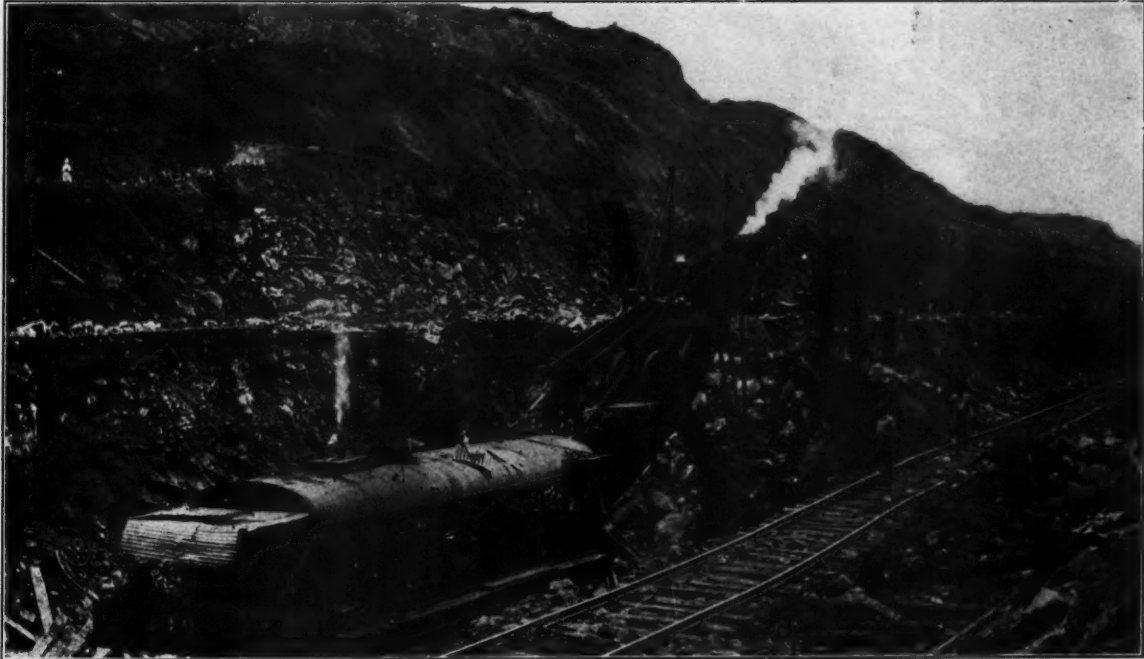
The mark of
quality



It protects the
user

Carnegie Steel Company

General Offices—Pittsburgh, Pa.



When the big ditch at Panama was cut

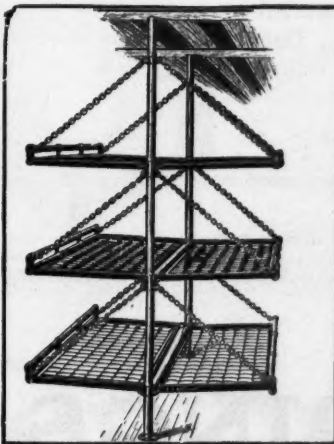
WHEN Uncle Sam rolled up his sleeves and went to work on this monumental engineering job, he found one of his biggest problems in proper sanitation. With thousands of men working within a few miles of the equator, the matter of providing clean, healthful sleeping quarters was considered of prime importance by the Sanitary Corps. So to prevent the inroads of fever carrying vermin, the government experts ordered vermin-proof bunks.

20,000 Romelink all-metal Bunks were used

for the army of workers who joined the two oceans. This conserved not only the health of these workers, but also their efficiency. The phenomenal progress made in cutting the canal proves that.

There's some food for serious thought for Main-

tenance Officials in that. You face similar problems on a similar scale. With labor scarce and costly, it behooves the man responsible for maintenance of way to keep his available men in top notch condition—to secure maximum efficiency from the labor supply at his disposal.

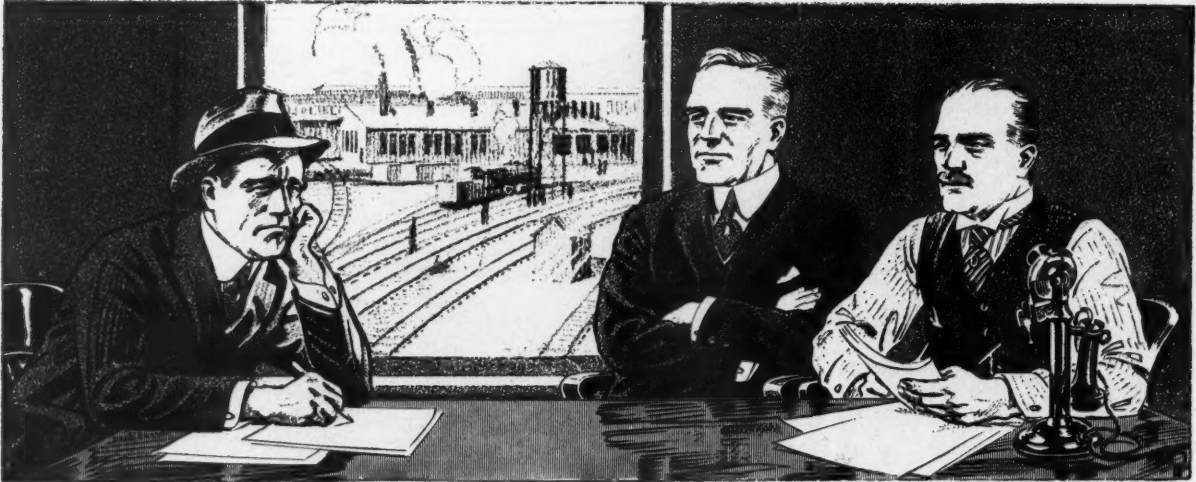


Clean, cool and sanitary sleeping quarters are an important factor in securing this result. Romelink All-Metal Bunks guarantee these conditions. Hand riveted steel frames; **sagless** springs galvanized to prevent rusting; no corners or crevices to harbor vermin, are a few of the good points in these fireproof, unbreakable and comfortable bunks. Ask us for details and prices.

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These Men Are Modern Maintenance Engineers

THEY have been trying to solve a very difficult problem. They've been choosing a bearing for their section cars—both hand cars and motor cars.

For a long time they have known that the plain bearing is behind the times—that it does not give the service demanded, in these days of efficiency.

They have recognized the fact that plain bearings, because they run dry and stick, waste the energy of the men and cause the gasoline and oil bills to mount sky-high.

Then, because they are men of brains and capacity for thought, they have looked over the field for a bearing that will give real service—a bearing that will fit modern standards.

And they have chosen the Hyatt Roller Bearing.

They chose the Hyatt Bearing because it is a powerful and sturdily built bearing. It is a simple bearing. There is nothing complicated about it. And it requires oiling but three or four times a year.

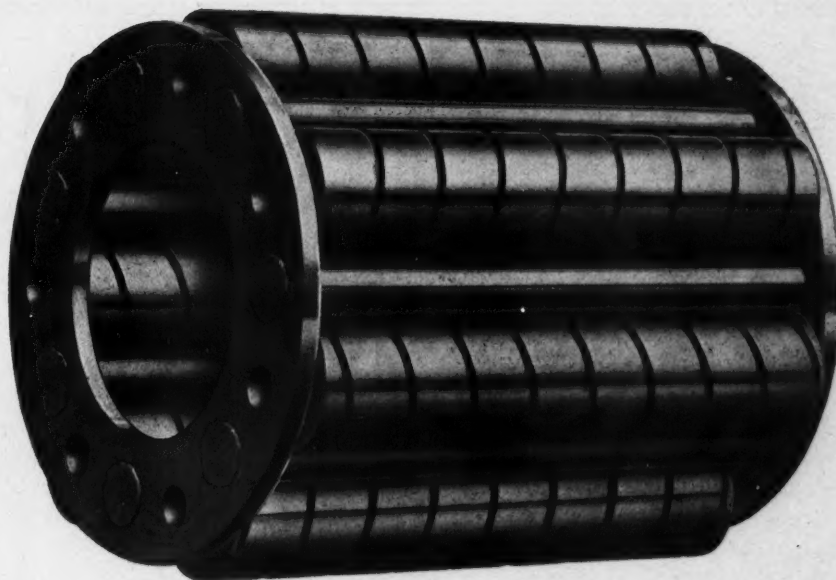
Equip your hand cars with Hyatt Bearings and notice how smoothly and easily they glide along the tracks. Notice also what a great deal more work your men are able to perform and how much more contented they seem.

No more backaches—no more puffing—no more sweating.

Also consider your motor cars.

You know that it takes power to overcome the

HYATT BEARINGS



friction of the old-fashioned plain bearings. And wasted power means wasted gasoline.

And with the present high cost of gasoline, you know this power becomes a mighty expensive item.

Then why waste it trying to overcome the friction of plain bearings?

Many tests have proved that Hyatt Roller Bearings will save the gasoline consumption in motor cars by at least one-third.

Besides this, motor cars equipped with Hyatt Bearings require lubrication but three or four times a year.

Compare this with plain bearings that must be lubricated practically every day.

A great many railroad companies have "seen the light" already. Hyatt equipped service cars have

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What are you going to do about your cars?

Drop us a card and we will send you all the information we have compiled.

Or write to the manufacturers listed below. They can furnish Hyatt equipped boxes for old cars.

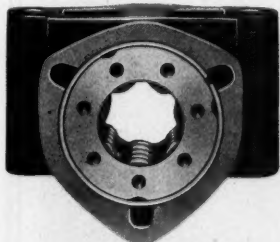
These boxes are very easy to install. And they cost but little.

Don't forget to specify Hyatt Bearings when you order new cars.

Hyatt Roller Bearing Company
NEWARK, NEW JERSEY

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THEY CAN FURNISH YOU**

Fairbanks-Morse Co.....	Chicago, Ill.
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Boxes for their hand and push cars	
Mudge & Company.....	Chicago, Ill.
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Fairmont Gas Eng. and Ry. Motor Car Co.....	Fairmont, Minn.
Boxes for all Fairmont cars—and all other makes of hand and push cars	
Northwestern Motor Co.....	Eau Claire, Wis.
Boxes for extra gang cars only	



Replacement box equipped with Hyatt Roller Bearing ready for installation on push or pump car.



Replacement box equipped with Hyatt Roller Bearing ready for installation on motor car.

1111

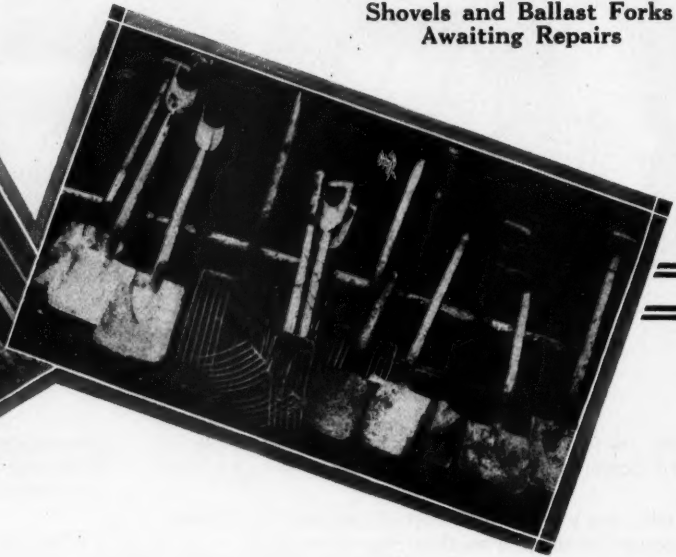
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Railway Maintenance Engineer

Volume 13

September, 1917

Number 9

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At the present time, when the track forces in many localities are engaged in mowing the right-of-way, it is pertinent to observe the extent to which such work can be done mechanically. In many places where lines are located along streams or in rough country, the right-of-way is so irregular that machine mowing is out of the question. In many other places the land now included between the right-of-way fences was originally level, but during the construction of the line those portions beyond the limits of the roadbed were cut up by borrow pits and waste banks to such an extent that these areas have also been made unfit for machine mowing. The obvious lesson to be gained from the latter practice is, of course, to reduce the disfiguration of the right-of-way in the construction of new lines to the minimum. However, this does not aid in the mowing along lines already built. An examination of the right-of-way in such places will show frequently that many of its irregularities can be removed sufficiently to permit the operation of horse-drawn mowers at relatively slight expense if the section forces are alive to the opportunities to do this work at odd times as occasion permits. By inaugurating a campaign along these lines and securing the interest of the track forces a surprisingly large amount of the right-of-way can be leveled so as to permit horse-drawn mowers to do this work at a large saving in cost and with an even greater conservation of labor. Roadmasters and section foremen alike can do much to lessen their labor by studying this subject and by making an effort to put it into practice.

The natural tendency in any large organization is to submerge the individual employee into the group with which he is associated. The logical result of this action is to reduce the interest and the efficiency of the man to that of those about him and that of the entire group falls to a low level. By failing to encourage and reward individual effort in the ranks the railways have encouraged this attitude until to-day, in the unorganized as well as the organized branches of service, there exists a general standard pace which is considerably below the maximum which might be secured. A number of individual railway men are awakening to this situation and are endeavoring to develop practical plans to encourage and reward special effort on the part of individual groups of employees. Premiums to foremen for well-maintained sections are elementary efforts along this line. The payment of a bonus to crossing flagmen, recently inaugurated on the Lackawanna and described on another page, is a means of rewarding these men for vigilance in preventing accidents. The same basic idea has been applied to the routine details of track work in the standard time and bonus system in use on the Baltimore & Ohio, which plan is also being tried experimentally and in modified forms on a number of other roads. The maintenance of way department is fortunate in that it does not have to encounter the opposition of organized labor on most roads in its efforts to introduce such plans. Existing labor conditions make the present an opportune time for the introduction of such systems and they deserve special attention from maintenance officers.

TESTING TRACK MATERIALS

ONLY a few years ago it was considered an unnecessary refinement to spiral a curve or to place a vertical curve in a grade line. At that time strap angle bars loosely bolted to the rails sufficed as joints. To-day these ideas have given way to those of more scientific determination. As a result various attachments and new devices have been developed which are intended to increase the strength or to reduce the cost of maintenance of the track.

American railway men have co-operated freely with the manufacturers in the development of these materials, giving them the benefit of their suggestions and the use of tracks for experimental installations. At the same time the manufacturers frequently complain that these tests are not conducted with sufficient care and do not receive the scientific attention necessary to ascertain accurately the real merits of the devices. As an instance, an engineer of an important railway recently based his report on a joint under extended test, on his observations made on a hurried motor car inspection without securing any data regarding the character of the maintenance which these joints had received or the amount of labor expended upon them, factors which have a very direct influence on their ultimate cost.

Because of the large amount of money involved in the purchase of any one of many devices and in their maintenance afterwards, it would seem advisable to secure the fullest information even if the collection of these data resulted in some initial expense and went beyond the details which would be practical in every day track work over the system. A test of a device in a track must conform in many ways with that conducted in a laboratory in so far as the amount of detail to be secured is concerned. It is just as much to the interest of the railways as of the manufacturers to ascertain the real merit of any device. It is one thing to place a device in the track and observe the length of its life and another thing to secure sufficient data at the various stages of the test to show its real merits.

BUILDING INDUSTRY TRACKS BY CONTRACT

IT has long been the custom of many railways to assume the position of a contractor when building tracks for an industry along their lines. The general practice has been for the railway to furnish all the material and the labor necessary for the work and on its completion to bill the industry for its proportion of the expense. Occasionally this procedure has been varied by the industry preparing the grade and furnishing the ties, but almost invariably the maintenance forces have been called on to lay the track.

While this arrangement has been mutually satisfactory in the past, a change has come about recently through the condition of the labor supply. With the section gangs short-handed and with many of them with less than half of their authorized strength, such work can be done by the section gangs only at the expense of their highly important regular duties. Under present conditions the withdrawal of the men from such routine duties for this special work is to be deplored. As it is not reasonable to expect an industry to have forces competent to perform the specialized work of switch installation or logical to expect it to consent to delays while they locate a specialist in work of this kind, the solution of the problem is up to the railway.

A method that has been followed with results satisfactory both to the industry and the railway is to let out such work to contractors. In practice the railway

makes its arrangements with one or more contractors who are known to be competent in work of this kind and when a request comes from an industry for tracks at its plant the industry is advised that the railway is unable to furnish the labor and the suggestion is made that the work be done by contract, mention being made of the fact that the road has previously arranged with certain contractors to do such work, although the industry is free to make arrangements with other contractors satisfactory to the railway. Where this method has been tried out it has proved a success. It has the advantage over railway floating gangs that living quarters need not be furnished for the men whom the contractor hires locally, with the exception of a foreman, and obviates the necessity for furnishing transportation.

MAKE THE CONVENTIONS WORTH WHILE

THE maintenance of way department is now passing through the most critical period in its history. Not only is it difficult, and in many instances impossible, to secure the necessary materials to maintain the tracks and structures to the desired standards, but the forces are not available to place in service all of the material which can be secured. At the same time the roads are confronted with the heaviest traffic they have ever encountered, and this unusual business, with the shortage of cars and other complications incident to it, is requiring so much attention from executive officers that they have not given the maintenance of way department the consideration it normally receives, and as a result they do not, in many instances, realize the seriousness of this conditions to-day.

The men directly involved in this branch of railway service are fully aware of the dangers ahead, with winter only a few months away, and this condition is creating increased interest in the conventions of the railway associations which will convene in September and October. These associations have risen to the needs of the occasion by revising their programs radically to make available for the members as much information as possible which will be of direct application to the problems confronting them to-day. The Roadmasters' association will give special attention to methods of recruiting, holding and feeding track labor, to the adoption of labor-saving devices and to studies of the track material problem. These subjects should give rise to extended discussion on the floor of the convention which should be of value to any man handling track forces.

The problems now confronting the roads are too large for individual solution; they can be only solved by the united efforts of representatives from a large number of roads. The managements can, therefore, well afford not only to permit their men to attend this convention, but if they desire to make the best of the present conditions they should encourage men to attend the meeting, for the three days spent at the convention will be reflected in the increased effectiveness of their forces throughout the remainder of the season.

In addition to the discussion on the floor of the convention, a feature of special importance in the program for the Roadmasters' convention is the trip to the Gary rail mill of the Illinois Steel Company, scheduled for Thursday afternoon. No one feature is complicating the analysis of rail failures at the present time so much as the inaccuracy of the reports of rail failures prepared by the track forces. When the roadmasters become fully familiar with rail manufacture and the common defects in rails, a long step will have been taken in increasing the accuracy of rail failure records. This trip has been considered of sufficient importance by the chief engineer

of one large railway for him to send a letter to the general superintendents asking them to instruct all of the maintenance of way officers attending the convention to make this trip to the rail mill.

Rather than postponing the conventions this year, the executive committees of the three maintenance associations holding meetings in the fall are to be commended for their attitude in meeting the issue squarely by revising their programs to make them of the greatest practical value to their members and to the railroads. If the associations are justified in normal years they are certainly of greater worth in times such as these when problems of greatly increased complexity are presented to their members.

A WIDER POINT OF VIEW

EVERY member of the maintenance of way department who would succeed should strive to have an outlook wider than his own work, his division or even his road. It is true that some railroads have perfected systems of training which enable them to produce highly efficient officers, in spite of a policy of self-sufficiency under which the practice of other roads has been largely ignored. That this policy has not resulted in failure or serious stagnation can be explained by the fact that not all of the employees and officers remain content behind a Chinese wall and through the individual observations of a few many of the good ideas developed on other roads have been investigated and adopted.

It is in this connection that the maintenance of way associations find their greatest usefulness. They enable men having common interests to exchange ideas and discuss problems, but still more they make it possible for the individual in a restricted environment to secure the point of view of others differently situated and to obtain some appreciation of the wide diversity of methods and standards in vogue throughout the country under various densities of traffic and physical surroundings. However, unless a man will supplement such periodic contact with his fellows by conscientious reading he is in danger of becoming superficial. While conversation and discussion have advantages that cannot be secured in any other way, nevertheless the amount of information that can be absorbed at a three- or four-day convention is incomplete unless supplemented by many evenings spent in study.

The *Railway Maintenance Engineer* has sought to present as broad an aspect of its field as the available space permits. It is the object to give due attention to branch-line standards of the lower grades as well as to the practices on four-track lines with heavy traffic. This is done not with the view to reaching the field of all of its readers, but with the idea that the readers will be interested in matters outside of their own individual tasks. A knowledge of all classes of conditions is of value, even though the individual has a restricted field. A branch line supervisor may have no use for machine-driven screw spikes, but he will be a more valuable man for knowing of them.

The same policy applies to matters outside the field of the individual reader. He will not make the most of his opportunity if he restricts his reading to articles concerning his own department. All railway men should be interested in matters regarding the railway as a whole and its relation to the public. Landscape gardening, water treatment, wood preservation, car loading, rate advances are all matters that do not enter into the daily work of the great majority of maintenance of way men, but a knowledge of these and other subjects will not only make them broader men of greater value to their employers, but will make their employment mean more to them.

LETTERS TO THE EDITOR

WE WILL ALL BE THERE

DANVILLE, ILL.

TO THE EDITOR:

It is the natural thing to take favors from the hands of the press and say nothing about it. It is just as natural for the average American to squeal like a pig under a gate when the same press says something that goes against the grain.

Previous to July 19 every indication pointed to a light attendance at the Roadmasters' convention, scheduled to be held at Chicago, September 18 to 20. On that day the executive committee met in Chicago and tore the program all to pieces. The members saw that the first duty of the convention in this year of war railroading was to devote its attention to the "labor and material problems which are of so much concern to the track department at present."

In your August issue you not only printed a copy of the revised program, but drove the facts home with some very pointed remarks of your own. I note that you have 7,446 actual subscribers, and from the way you have stirred up our men with just one article in one issue, they must all be roadmasters. One man who has never attended a convention wrote me shortly after reading your August issue: "I notice you are going to discuss the best method of securing and retaining track labor. I don't know that anyone will know the *best* method, but I am anxious to hear of *any* method. I'll be there."

An old friend of mine, who is a roadmaster on one of the roads in Canada, tells me they are not cutting off track bolts and are hunting along the track for bolts that may have been overlooked. He will be at the convention to hear what W. A. Summerhays, assistant purchasing agent of the Illinois Central, has to say on "The Present Maintenance of Way Material Problem."

Scarcely an office in the country has failed to give one or more of its engineers to the engineering regiments in France. We are sending our men there to rebuild their railroads, but when our railroads fall down there will be no other nation to send its men here to rebuild ours. Their railroads have not been shot to pieces, but they have been worn out. Although our railroads may stumble, they will not fall down, but I am afraid it will be up to the roadmasters in their convention to give the jolt that will make us all see the danger of falling.

JAMES SWEENEY,
Supervisor, Chicago & Eastern Illinois.

THE AMERICAN HOBO (avis rara)

CAMP SIDING, U. S. A.

TO THE EDITOR:

In a discussion on the scarcity of labor for track work recently, a roadmaster remarked in an offhand way as though saying nothing out of the ordinary, that "the trouble with the hobo is that there has never been any closed season on him and he is becoming a rare bird. Not many years from now one of the younger roadmasters will be going through a museum with his boy. The boy will see some peculiar stuffed object and ask his father what it is. The father will tell him it is the stuffed hide of a creature once considered human, but that it was afterward regarded as of the lower order of animals and that society had killed them all off—the American hobo." That remark has been in the writer's mind ever

since. The longer I think of it the more truth there seems to be in it. There has been little, if any, protection for the hobo and now that we need him he is gone. It is an American trait to eat our cake to-day and gnaw on a crust to-morrow. We did it with everything we ever got our hands on, from the wild turkey to the quail, so why make an exception to the rule for one of our own kind?

We have always considered that a man who was once a hobo would always be one, but I have found that if some of them get on a new outfit of clothes they can step up into a higher class of work and live up to the scale of life that the men in that class enjoy. Just let this soak in deep—the world is not making hoboes right now. One of these days, so soon that we will all be astonished, we will wake up to find that there are no hoboes and instead of having only a few men in our extra gangs we will have none at all.

There are not as many dangers lurking in the path of a little cottontail rabbit as there are pitfalls for a man when he starts to tread the paths of hoboland. His work is hard work, not the hard work that the mechanic does when going at top speed or the farmer in the harvest, but hard work nevertheless. Any man doing this work should have good food to eat, a good bed in which to sleep and a place to keep clean. When he is not working he is either begging or drinking. A man can live on the crumbs from the table of the rich man, but he will not gain much strength and no one ever was so rash as to suppose that the hobo's style of intoxication is conducive to efficiency while sobering up in the gang.

Our floating or extra gangs have been built up on the idea of providing the poorest quarters for the meanest kind of men. I believe we will have to do some right-about-face moves and do them quick. This labor problem cannot be handled by a man wearing gloves and it is too big a thing for a man to talk about while he is looking over both shoulders to see what effect his remarks are having on the division engineer, the superintendent, the chief engineer and the general manager.

I have done my share of this contributing. One day I wrote a little article on the supply of track foremen. About a week after the paper was off the press I got a letter from the chief engineer expressing his appreciation of the tone of the article. Do I need to tell you that I was looking behind me when I wrote it? The sentiments I expressed were all right as far as they went, but they did not go far enough, and for all of their liking them there has been no move made to put a single one of them into effect.

We have often wondered just what the average life of a hobo is. Any roadmaster can tell you that it is not very long when he stops to think of the way the old-timers disappear. As they are thinned out the employment agencies send out younger men to take their places. Last year they sent out a few, this year they are not sending out any. The railroads are not the only people on the books of the employment agent this year. The farmer and the manufacturer are there. With his two-dollar corn and his three-dollar wheat, the farmer can afford to offer both good wages and good food. With advanced prices for his product the manufacturer can also offer good wages. The railroad manager with his same price for hauling is not a very successful competitor for the labor of these young men from a monetary standpoint and the stories that have been circulated about his eating and sleeping accommodations are not such as would cause these men to go with him if it entailed any sacrifice on their part. That would be polishing it over about the way we would expect an officer to say it, but the plain

facts are that he is not willing or able to pay as much as his neighbor pays, his grub is not fit to eat and his beds have bugs in them.

The man who has worked for years on the track would rather stay there. He can take a slow gait and get in the day fairly easy, but when high wages are offered for the same kind of work in a factory he can change. That he is so scarce on the railroad is fairly conclusive evidence that he does change.

Another thing that we are apt to lose sight of is the fact that the country has been getting drier and drier and there are great stretches in all states where there is no opportunity to get drunk. Once let a hobo get into a dry town on payday and he will buy a new suit of clothes, new underwear, a new shirt, a new pair of shoes, a new hat, a new shave and a new hair cut. You let any man do all that to himself in a town where he cannot get drunk and, no matter if he has been a hobo in rags for the past 20 years, he immediately ceases to be a hobo and becomes an American citizen.

Yes, the hobo has become a rare bird. But who will take his place? That is the easiest question on earth to answer. When any line of work drops to a level where no one will work at it the work must be elevated to a level with the labor available. If this is done, the "Queen," with her boarding camps, whether she be real or but the fancy of some hobo mind, will be first to go. Following her so close as to tread on her heels will be the 16-man bunk car with its straw bunks, populated by a million bed bugs and lice, then the hand car, the tamping bar and all the rest of the antiquated implements of torture. When they are all gone and in their places come the sanitary sleeping cars, the company boarding camp, the motor car and the other machines that our American genius can invent if it is encouraged to do so, we will find men in those gangs that are men; men such as toil in our railroad shops and sit at the throttle of the locomotives.

OLD TIMER.

NEW BOOKS

Proceedings of the American Railway Engineering Association. 1,721 pages, illustrated, 6 in. by 9 in. Bound in half morocco, cloth or paper. Published by the American Railway Engineering Association, Karpen Bldg., Chicago. Price, half morocco, \$7; cloth, \$6.50; paper, \$6.

This is the largest single volume ever published by this association and contains only a slightly smaller number of pages than the proceedings for 1911, which were published in three volumes. As usual the volume is divided into three parts, 1,438 pages being devoted to reports of committees, 41 pages to discussion on the floor of the convention and 142 pages to special reports and papers. The reports follow the order and character of previous years, being for the most part in the nature of current work, continued from year to year. The rail report is by far the largest and, in addition to the customary report of rail failures, includes a number of comprehensive papers on rail manufacture, testing, etc. The report of the committee on ties contains an extensive report on the influence of tie plates and spikes on the durability of ties. The report on wood preservation includes the usual service records of cross ties. Of the special papers the first and longest one is the complete report of the Joint Committee on Concrete and Reinforced Concrete, comprising 63 pages. Other matter of special interest in this volume includes a report on electrolysis by a joint committee formed for that purpose; a study of ties, tie plates and spikes taken from abandoned track on the Lackawanna, and an illustrated report on the finishing of concrete surfaces.



An Improved Camp on the Lackawanna

PROVIDING BETTER BUNK CARS FOR MEN

Several Roads Have Recently Created Improved Quarters by
Reconstructing Passenger and Freight Equipment

IN the last two issues the need of comfortable sanitary lodgings and wholesome, properly prepared food was discussed in detail with respect to its influence on the holding of maintenance labor. The necessity for proper housing was repeatedly emphasized, whether in temporary buildings or in cars. Converted freight cars have been used in this service for a great many years and while they have a number of shortcomings as compared to portable buildings, they have one important advantage in the ease with which the entire camp may be removed from one place to another.

Some railroads have replaced the converted freight car in part by old passenger equipment, but ordinarily their use has been restricted to the bridge and building forces or other crews of more highly skilled labor, or to only a small proportion of the track forces. In consequence, the ordinary box car still offers one of the most ready sources of temporary quarters for extra track gangs. With this idea in mind a number of roads have directed their efforts to the improvement of the converted freight car rather than to the search for a substitute, and to this end an outline is given below of the results secured, together with a discussion of some of the elements to be considered in outfitting cars for this service.

BUNK CARS

The bunk car is by far the most important item in the camp equipment since the majority of cars in any camp will be used for that purpose. The two principal tendencies in improving the bunk cars have been the introduction of steel bunks with wire springs and the reduction in the number of bunks per car. Where the number was formerly 16 it is now being reduced to 12 or 8. The Missouri Pacific, however, has eliminated the principal objection to the 16-bunk car by providing a window for every bunk, equipped to open readily, so that each man has control of the atmospheric conditions in his own bunk.

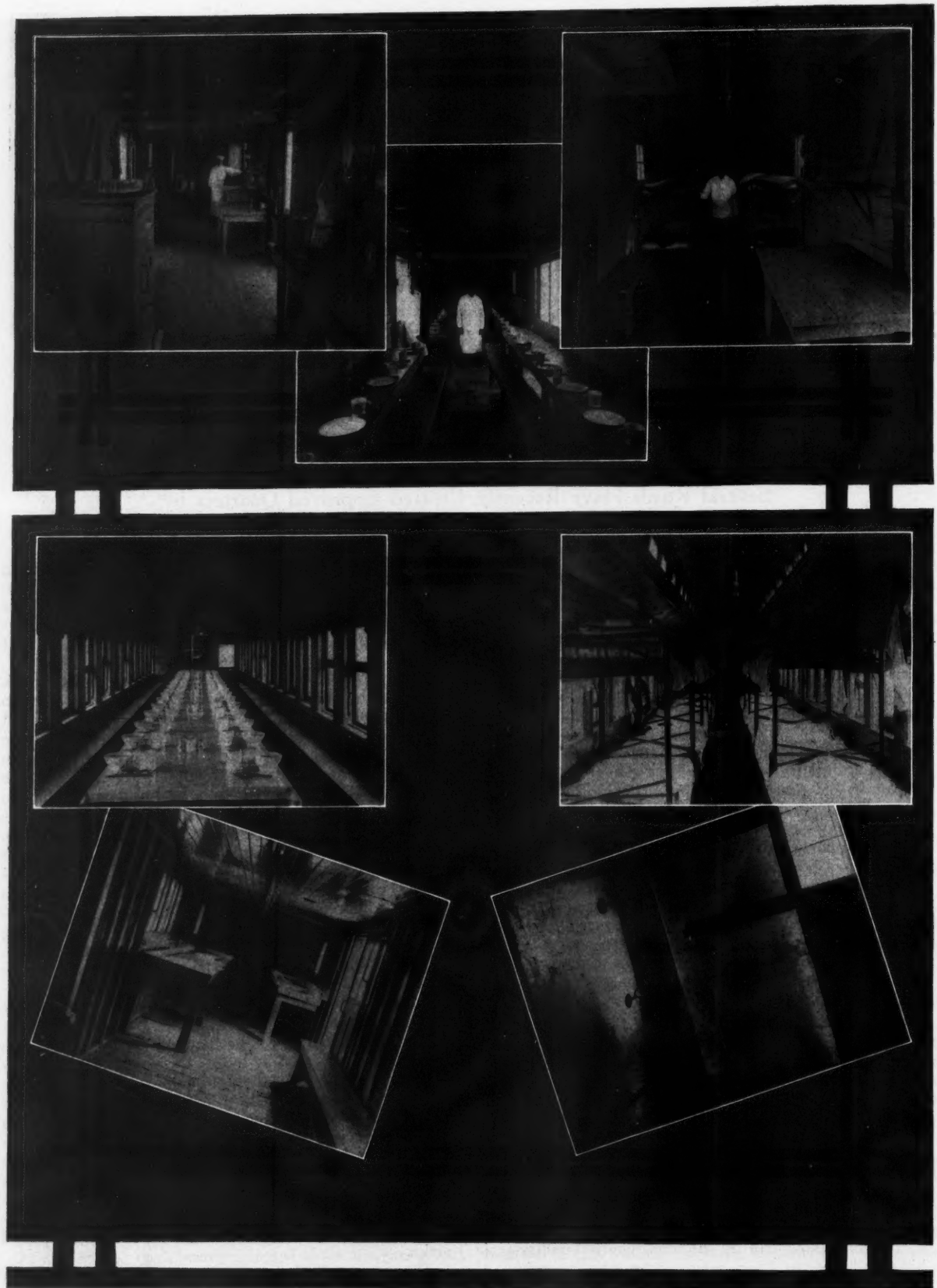
With the 16-bunk car there is not much chance for variety in the arrangement of the bunks, but in the 12 and 8-bunk cars the arrangement may be varied. Usually

the bunks are placed near the ends of the cars, leaving the central portion for a stove, table, benches, etc. Even for cars in which the men do not board themselves benches and tables are an important item in adding comfort, since they afford the men some place to sit so that they can play cards, read, etc.

The awkward means of entrance in the old style bunk car, with the sliding door and ladder consisting of two cleats nailed on a couple of scantlings, is being replaced in modern cars like those of the Lackawanna and the Lehigh Valley, shown in the photographs, by a wooden stairs and landing set outside of the door, while the sliding freight car door is replaced by one swinging on hinges. The standard bunk car on the Lackawanna has swinging doors in both sides and both ends. Those in the sides are Dutch doors, parted at mid height so that the upper half may be opened to serve as a window while the car is in motion. The Missouri Pacific has a design of door in which a panel in the upper part is fastened on hinges so that it will swing downward, giving an opening about 30 in. square that is fitted with a screen.

Among other special equipment for bunk cars may be mentioned lockers. These have been suggested occasionally, but have not been generally provided. The Southern Pacific has furnished lockers 30 in. square extending from floor to ceiling between each pair of bunks in its bridge and building bunk cars which are commonly provided with more elaborate equipment than that furnished in cars occupied by track laborers. A place for wash basins, with a shelf above for a water pail, is a convenience appreciated by the men, but a better arrangement when it can be provided is a wash car, such as forms a part of the model camp of the Lehigh Valley, shown in one of the accompanying photographs. This camp has the further luxury of a bath car providing shower baths and porcelain bathtubs of standard make.

The converted passenger car, because of the neater finish, better ventilation and more adequate lighting, is a much more satisfactory car for lodging men than the converted box car. The passenger car does not lend

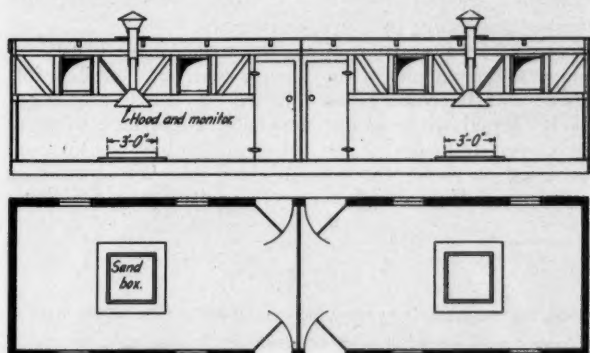


ABOVE—KITCHEN, DINING AND BUNK CARS ON THE LACKAWANNA. BELOW—OLD PASSENGER CARS USED FOR DINING AND BUNK CARS, THE WASH CAR AND SHOWERS IN THE BATH CAR, LEHIGH VALLEY CAMP OUTFIT

itself as readily to the construction of wooden bunks as the freight car, but this should be considered an advantage rather than a disadvantage. One of the photographs illustrates a converted passenger bunk car on the Lehigh Valley.

DINING AND KITCHEN CARS

Ordinarily the dining car contains little or no furniture but the table and benches used at meal time. Consequently the only question involved in the design of the mess car is the seating arrangement. The common plan is to provide one long table with benches on either side. This offers the alternatives of the unsymmetrical arrangement shown in the Missouri Pacific car where one bench is against the wall and the symmetrical arrangement of the Lehigh Valley car where the table occupies the exact center of the car with an aisle on each side behind the benches. The unsymmetrical arrangement has the advantage of one wide aisle along one side of the car



A SOUTHERN PACIFIC CAR FOR MEXICANS

rather than two aisles, both of which are somewhat narrow. However, with one bench against the wall it is necessary for the men to slide along the bench until they reach their places.

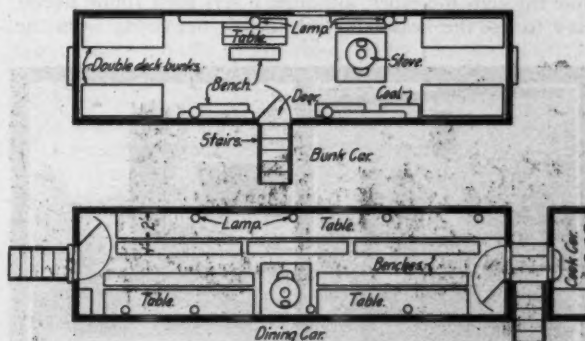
The Lackawanna dining car has a somewhat unusual arrangement in that there are two tables, one along each side of the car with benches on either side of the center aisle. This scheme overcomes the disadvantages of the two plans previously outlined, but offers a new disadvantage in that it requires more passing back and forth of the food between the men than is the case where men occupy both sides of the table. The Lackawanna scheme, however, lends itself readily to the placing of the stove in the center of the car where more efficient heating is possible.

The standard height for the dining tables is 30 in., but for benches there seems to be a considerable difference of opinion. Those for the Missouri Pacific are 1 ft. 4 in. high, while those for the Lackawanna are 1 ft. 8¼ in. high. Dining cars must be provided with end doors to facilitate serving from the kitchen car. In the Lackawanna car the end doors are used entirely both for serving and for the entrance and exit of the men at meal time.

Two of the photographs show the interiors of kitchen cars. Cleanliness should be the keynote of the kitchen and the cars should be provided with every facility for keeping them clean with the least amount of work. Screen doors are an absolute necessity on the kitchen doors, if not on the others. Running hot and cold water saves much work and time for the cook and can be provided by suitable tanks or barrels placed so that the bottoms are above the level of the sink.

MISCELLANEOUS CARS

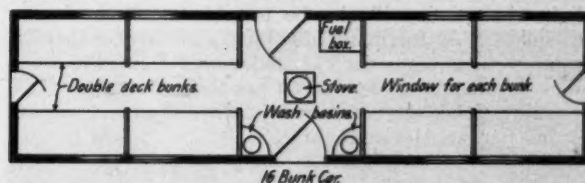
Italians, Greeks, Chinese and Japanese prefer to board themselves on a co-operative basis, the men occupying a single car serving as a unit for this purpose. To make this possible there should not be more than 12 and preferably not more than 8 men in each car, in order that there will be adequate space for the men to conduct



A LACKAWANNA CAR WITH SIDE TABLES

their cooking operations with the desired degree of cleanliness. Where the men prefer to board under this system the cars must be outfitted with necessary kitchen stoves, tables, benches, etc.

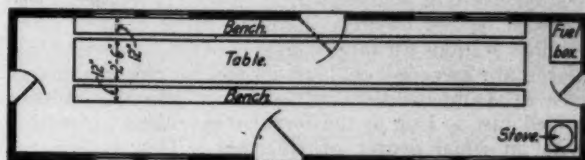
The housing of Mexicans in the Southwest offers a special problem because these men are usually accompanied by families. They must in consequence be housed in family groups, but as their wants are very primitive this is not so serious as it might seem. The



16 Bunk Car.



8 Bunk Car.



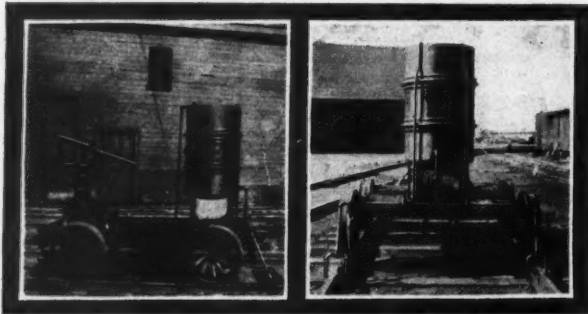
Dining Car.

MISSOURI PACIFIC CARS WITH MANY WINDOWS

quarters cars furnished them are ordinarily divided into two rooms to accommodate a family each like the plan for the Southern Pacific car shown in one of the drawings. These people have no use for stoves, tables, chairs and beds, considered necessities for other nationalities. All they need is a bare room with a box of sand placed in the center on which they can build an open fire, the smoke and gases of which escape through a hood and monitor in the roof.

DEVICE TO OIL TRACK FASTENINGS

IN order to oil the track fastenings on the Louisiana division of the Illinois Central, the apparatus shown in the photographs has been devised. It consists of an old drum mounted on one end of a push car. A small oil heater is placed on the floor of the car underneath the drum to heat the oil when necessary to secure the proper flow through the pipes, although it has been found necessary to use the heater on only a few occasions. On the



THE OILER READY FOR USE

opposite end of the car a small hand-operated air pump is installed to facilitate the flow of the oil through the pipes, this pump being built from a discarded locomotive air pump. The oil passes from the drum through small pipes and outlets on each side of the rail.

This car has been used successfully in the oiling of joints, bolts, rail anchors, tie plates and the base of the rail on tracks in the New Orleans terminal. With slight changes it will also be possible to oil the heads of spikes. A foreman and four men are ordinarily required to operate the car and cover from $1\frac{3}{4}$ to 2 miles of track per day at an approximate cost of \$4 per mile. This car was developed by Thomas Quigley, roadmaster at McComb, Miss.

EFFICIENCY AWARDS FOR CROSSING WATCHMEN

FOR several years past the Delaware, Lackawanna & Western has had in effect a bonus system of payment in the maintenance of way department, in so far as the track forces are concerned. The system provides that the flat sum of \$10 per month, in addition to the regular monthly salaries, will be paid as an efficiency reward to section foremen who have taken the first prize on their sections for three consecutive years. The annual prizes are awarded on high inspection rating and low cost of maintenance. The extra compensation is continued just so long as the foreman maintains his section with an equal degree of efficiency. This system has proved very satisfactory, and, effective May 1 of this year, the bonus system of payment was extended to include the men employed as crossing watchmen. In this branch of the service the bonus is also to be a reward for efficiency, but is to be paid at the end of the year in a lump sum rather than in the form of extra monthly compensation. In all cases the bonus is 5 per cent of the salary paid.

In working out the plan, the men employed at joint crossings, where other roads are concerned, which cannot adopt a similar scheme of payment, have been taken over by the Lackawanna. The crossings have been classified in accordance with their importance into three classes, A, B and C. The monthly compensation for the

men stationed at the most important, or class A crossings, is \$60; at class B, \$50, and at class C, \$42.50.

In addition to filling out the standard maintenance of way forms, or application for employment, all the men employed are required to pass a physical examination, the physical requirements varying for the different classes of service. The men in classes A and B are examined by physicians, and those in class C by the roadmaster or supervisor. Good eyesight and hearing, ability to read and write and some railway experience are required of the men of all classes.

In class A, in addition to the requirements cited above, the men must have all of their limbs, must be active and quick and in every respect physically able to attend gates. The requirements for class B service are similar to those of class A except for the full complement of limbs, men who have lost one arm or one leg being eligible to this class. At the less important or class C crossings, the men employed must satisfy the roadmaster or supervisor that they are physically able to discharge the comparatively light duties in a proper manner.

In the reorganization of the department, the plan provided that men old in the service and not qualified for class A or B crossings be assigned to class C crossings. In its actual working out, however, a shortage of men developed and some of the old men who had lost an arm or a leg or were otherwise disabled and who were not old enough for a pension were assigned to crossings

D. L. & W. R. R. CO.

FORM FOR THE EXAMINATION OF GATEMEN OR FLAGMEN FOR "A AND B" CLASS
HIGHWAY GRADE CROSSINGS. TO BE FILLED OUT BY EXAMINING PHYSICIAN
Office of Prin. Asst. Engr. April 14, 1917 Hoboken, N.J.

Name of Gateman or Flagman.....
Name of Crossing.....Class of Crossing.....
Town or Location of Crossing.....
Roadmaster.....Division.....
Hearing is.....Eyesight is.....
Able to distinguish colors.....
Has Both Arms.....Has Both Legs.....
Can Speak English.....Can Read English.....
Is Physically Able to Attend Gates.....
Remarks.....

NOTE: Form must be filled out by the examining Physician before
Gateman or Flagman is employed and sent to the office of
Prin. Asst. Engr., Hoboken, N.J.

Date.....Examining Physician.....

THE EXAMINATION FORM

out of their class. This is to be remedied when a sufficient number of men are available. All men new in the service must comply with the regulations. The plan further provides for the men of all classes to be relieved one day a month without loss of salary.

A record is kept of all the crossings and the bonus, which amounts to five per cent of the total salary, is paid on the completion of a year's service to the men who have gone through the year without an accident. While the plan is yet new, it is felt that the care exercised on the part of the men must necessarily result in having men at all crossings that are fully competent, both phys-

ically and mentally, to discharge their duties in a proper manner, and that the bonus for efficiency will supply the incentive for each man to give his best efforts to the work

and the combination of the two will result in a much improved service and a great reduction in the likelihood of accident.

Service Records of Crossing Foundations

IN 1912 the two steel crossing foundations of the type manufactured by the International Steel Tie Co., Cleveland, O., were installed at the intersection of the single track main line of the Union Traction Company of Indiana and the double track main line of the Big Four at Muncie, Ind., the first of over 40 of these crossings to be put into service on the last-named road. After about five years of hard service the first two founda-



A CROSSING FOUNDATION INSTALLED IN 1912

tions are still in place. They consist of five sections, each built up of two 6-in., 10.5-lb. channels with a 5-16-in. by 20-in. top plate and 5-16-in. by 4-in. by 1-ft. 8-in. battens spaced 2 ft. between centers on the bottom. These were riveted together with $\frac{1}{2}$ -in. rivets with a 6-in. pitch, and a 6 in. 17 $\frac{1}{4}$ -lb. I-beam diaphragm was provided under each rail intersection. This structure was delivered to the site of installation where the purchaser's track gang filled it with concrete, reinforced with $\frac{1}{2}$ -in. rods spaced at 3-in. centers. After allowing the concrete to set for two weeks the foundations were installed and two built-up crossing frogs of 90-lb. A. S. C. E. rail were fastened in place with malleable iron clips and steel wedges spaced at about 12-in. centers.

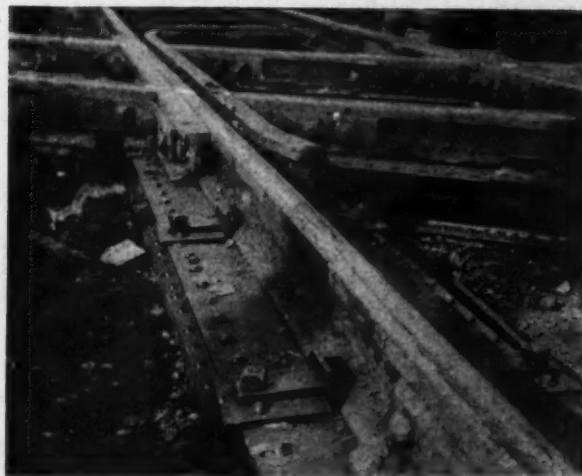
A crossing frog of the same construction was installed on wooden ties at this point at the same time, but under the lighter two-way traffic of the Lake Erie & Western which parallels the Big Four tracks on an adjoining right of way. After 4 $\frac{1}{2}$ years of service the frogs on the steel foundations were as good as when installed except for tread and flange wear on the running rail heads. At the same time the crossing frog installed on wooden ties was so badly racked that it had to be renewed, although wear on the running rails was only slight, as may be observed in one of the accompanying illustrations.

During the four years since this foundation has been in service the following amounts were spent on the Big Four crossings for labor and material for each year, respectively: 1913, \$16.57; 1914, \$29.86; 1915, \$37.58, and 1916, \$35.27; or an average of \$14.91 per crossing per year. This maintenance included resurfacing once each year, and necessitated the removal of a part of the plank-

ing in the street crossing at this point. Resurfacing was delayed nine months at one time, owing to a controversy between the electric line and the steam railroad regarding the division of the maintenance charges on these and other crossings. Only 34 bolts were renewed during the 4 years and most of these were required after the period of controversy. It is also interesting to note that the average cost of maintaining these two crossings in the years prior to installing the steel foundations was about \$60.50 per crossing per year as compared with \$14.91 after the foundations were installed.

Since this first foundation was installed a large number of others have been placed in service on various railroads, many of them in locations where they are subjected to extremely heavy traffic. Among these may be mentioned one on the Wheeling & Lake Erie, in a location where speeds up to 60 miles an hour are obtained, with train movements totaling upward of 120 per day in addition to switching movements. The crossing originally installed on this foundation has been renewed once because of wear since the original foundation was installed and new frogs were installed without making any alterations to the foundation.

The experience with the first installation along with several others installed in 1912 and the following year resulted in the introduction of 6-in., 10.5-lb. channel



THE MANNER OF FASTENING THE FROGS

diaphragms spaced at about 4-ft. intervals in subsequent designs. These were punched so that the reinforcing rods could be threaded through them before placing the concrete. The plate widths were varied from 16 in. to 22 in. in 1-in. and 2-in. variations to provide clearance for the clip fastenings around one, two and three-rail frog combinations. The diaphragms were introduced to support the top plate and stiffen the structure, and the punching for the reinforcing rods was provided to fix their position in the concrete. Later more diaphragms were added and $\frac{1}{2}$ -in. twisted rods provided in place. Six rods were used with a 22-in. and 21-in. plate foundation

and 5 with an 18-in. plate. The over-all depth of these foundations was maintained at about $6\frac{1}{2}$ in. and the minimum width at 18 in., as both of these dimensions provided the necessary flexibility and ample bearing area for the heaviest rolling stock.

This combination of a steel trough filled with reinforced concrete established the fact that the foundation principle was right, but the impact caused by heavy locomotives and cars passing over the foundations resulted in failures of the concrete filler when the foundations were not carefully maintained to surface. The most serious objection arose from the fact that the mixing and placing of the concrete and reinforcing was frequently left to track labor, which was not familiar with this class of work. The divided responsibility was also unsatisfactory from the standpoint of both the users and the manufacturer.

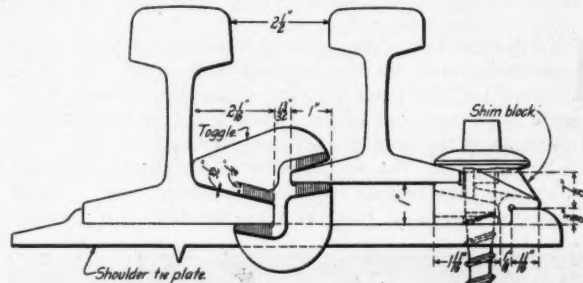
In order to obviate these difficulties the present design, consisting of a full box girder with a plate top and bottom reinforced with diaphragms at the intersecting rails and filled with creosoted wooden blocks, was brought out about two years ago. This placed all the responsibility for design and construction with the manufacturer because the foundations, when shipped, were ready to install. The full box girders were engineering structures designed to carry the heaviest locomotive over a 6-ft. span. The interior was filled with creosoted wood blocks because it would allow for deflection in the girders without failure. At the same time the blocks made the supporting girders resilient and it reinforced the plates by transmitting concentrated loads from the top to the bottom plates. The blocks also reduced the noise incident to an all-steel foundation, and preserved the interior from corrosion. The block is made of dimensioned yellow pine fit tightly in place. As a matter of fact, these blocks are purchased slightly over size in height so that they are drawn down tight when the top plate is riveted on the box girders.

At the time that the filler was changed, a new type of rail fastening was provided in place of the malleable clips. The new form of fastening is made up of a $\frac{1}{2}$ -in. bent angle riveted to the structure. A $\frac{1}{2}$ -in. by 2-in. clip passing through an opening in the vertical leg of this angle and over the rail base serves to hold down the crossing. Any lateral movement of the frogs is resisted by the riveted angles and vertical movement is prevented by the combined clip and riveted angle. The fastener problem, however, has never been a serious one, for a locations where relining of the crossing frogs had been necessary every few months the old type of fastening held the frogs so securely to the foundations that line was maintained even four years after the foundations were installed.

CURVE GUARD RAIL FIXTURES

THE holding of guard rails where they are used on sharp curves, so that a uniform width of flangeway can be maintained in spite of the continuous action of wheel flanges is a source of frequent trouble. Consequently any new development for holding guard rails is of interest to trackmen. A device of this kind is shown below. The main and guard rails are supported on tie plates extending under the two rails with shoulders at each end. The guard rail, which is of lighter section than the main rail, is raised to the desired height by means of small malleable iron pedestals or shims placed under the far edge of the base of the guard rail and by a toggle having jaws to engage the adjoining flanges of the main and guard rails. These toggles are placed in

the spaces between the ties and in addition to acting as supports for the guard rail they serve to hold it against overturning, as this moment is resisted by the weight of the wheels on the main rail. In addition, the combined action of the toggle and pedestal, which is held in position by a screw spike, serves to maintain the width of the flangeway between the heads of the two rails.



SECTION SHOWING FITTINGS IN PLACE

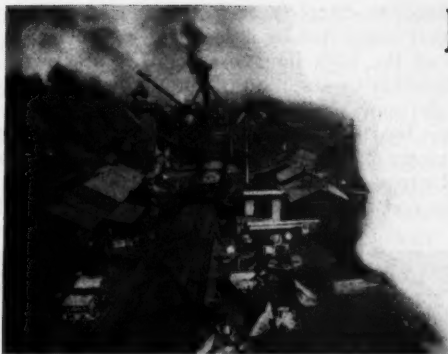
The device is simple of application and has the advantage that the guard rail may be changed at any time without disturbing the main rail or the tie plates in any way. By using toggles and shims of different sizes, combinations of main and guard rails of widely differing sections may be utilized and, if desired, variations in the relative height of the shim block and the vertical distance between the jaws of the toggles will permit canting the guard rail as much as may be deemed necessary.

The device has been patented by Thomas Maney of Louisville, Ky., until recently general roadmaster of the Louisville & Nashville, of Louisville, Ky. It has been in service since February, 1916, on an $18\frac{1}{2}$ -deg. curve



THE GUARD RAIL ON A WYE TRACK

forming one leg of a wye on the Louisville & Nashville at Latonia, Ky., the installation being shown in the photograph. The track is subjected to a heavy transfer traffic handled by large locomotives. The flangeway is $2\frac{1}{2}$ in. and the gage 4 ft. 9 in. The main rail is of 80-lb. A. S. C. E. section and the guard rail is of an old 60-lb. section with the top of the head placed $\frac{3}{8}$ in. above the main rail. It is said that no breakages have occurred in any of the parts during this time and that the track is still free from noise and rattle while the throat clearance remains the same as when installed, except for such wear as has taken place in the head of the guard rail. Similar installations have been made on other tracks.



REBUILDING A TUNNEL ROOF THROUGH SAND

Difficulties Encountered in Relining the
O. W. R. & N. Bore at Portland
with Concrete Led to
Extensive Redriving

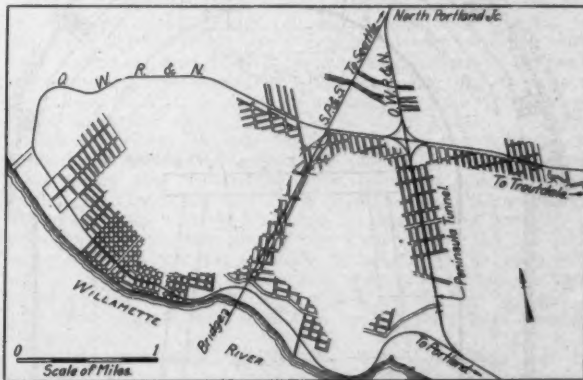
IN replacing the old timber lining of the Peninsula tunnel of the Oregon-Washington Railroad & Navigation Co. at Portland, Ore., difficulties were encountered which led virtually to a partial redriving of the tunnel above the crown of the old timber arch. Interesting methods were developed in this work and the physical layout was such as to lead to the use of an unusual plan for the delivery of the concrete for the new lining. The project required a year's time and a large force of men was employed.

This tunnel is located in a flat top hill on the north side of the Willamette river opposite the city of Portland on a peninsula between the Willamette and Columbia rivers. The railroad layout is shown on the accompanying map. The tunnel was built in 1910 to eliminate the 6-mile loop around the hill and to permit of a connection with the then recently completed Spokane, Portland & Seattle line, since the physical layout at the crossing of this line with the loop line is such as to make a wye connection difficult to secure. The tunnel has been used by all Oregon-Washington freight trains, also all passenger trains of that road between Portland and Seattle.

The tunnel passes through glacial drift, consisting of a loose pea gravel that acts much like buckshot. The tun-

clearance to 22 ft., it was decided not to place the new lining inside of the old one. In consequence plans were made for a new lining of standard proportions to be constructed at grade irrespective of the location of the old tunnel lining.

A contract was let to A. Guthrie & Co. of St. Paul, Minn., and Portland, Ore., and work was started on December 20, 1915, operation through the tunnel being abandoned by detouring all freight trains around the peninsula and running passenger trains to and from Seattle over the Willamette river bridge of the S. P. & S. The first step was to put in a concrete invert, which was completed without difficulty. This consisted of an inverted arch having an inside radius of 24 ft., a thickness of 18 in. and a crown 1 ft. 7½ in. below the top of tie at the center line of the track. The excavation and con-



MAP OF THE PENINSULA



SUBSIDENCE ON THE SURFACE

nel is 5,435 ft. long and was originally lined with timber to give a clear opening 17 ft. wide by 20 ft. high. In 1915 it became desirable to replace the original lining with a permanent one, and owing to the fact that the tunnel had settled in some places as much as 28 in., that a lowering of the grade was not desirable on account of the high level of flood water in the Willamette river, and because it was deemed desirable to increase the vertical

creting operations were facilitated by raising the track 4 ft. and carrying it on 10-in. by 14-in. cross beams supported from the posts of the old lining. The rails were respaced for a 24-in. gage track, which was used by small cars in carrying out the excavated material and delivering concrete.

After the invert was completed the contractor erected steel shields at each end of the tunnel. These shields had adequate dimensions to clear the outside of the new tunnel lining and were designed for operation along the lines used in subaqueous tunnel work. However, after driving these shields for a distance of about 100 ft. at each end of the tunnel this method of procedure was found to be impracticable and the shields were abandoned by concreting them into place in the lining. After this experience it was decided to build the new concrete side walls inside of the old lining and drive a new drift above the old timbering at a sufficient clearance to permit the construction of a concrete arch at the desired height.

The side walls of the new lining were made 32 in. thick and since the faces of these walls were only 6 in. inside of the faces of the 14-in. posts of the old lining, it was necessary to remove the old lagging and excavate behind it to get the required width. To do this with safety it was necessary to replace the lagging, holding it out at the required distance by filler blocks placed behind the posts. The old posts were spaced 18 in. center to center, and in making these changes every other one was removed before the concrete was placed. To hurry this work on the old lining it was carried on simultaneously at a great many points along the entire length of the tunnel.

The concreting of the new lining and the raising of the arch were facilitated by the construction of a "high line" supported on frame bents, each consisting of two posts with a cap at about the level of the springing line. This high line served as a support for the temporary tunnel timbering and also carried a 24-in. gage track used in the various operations.

TUNNELING METHODS

The tunneling for the new arch was conducted on the completed side walls by means of the American method of drift and wing mining. A center top heading was advanced over the top of the old timber arches. This was 5 ft. high by 6 ft. wide and was timbered with heavy

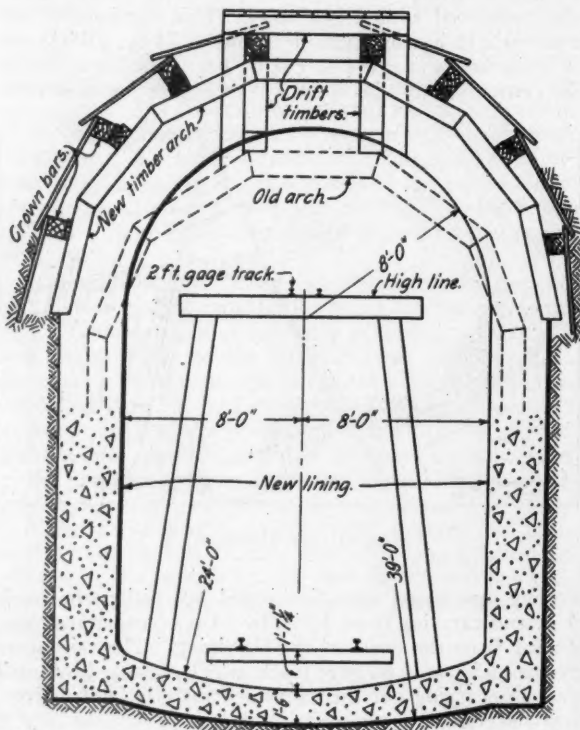
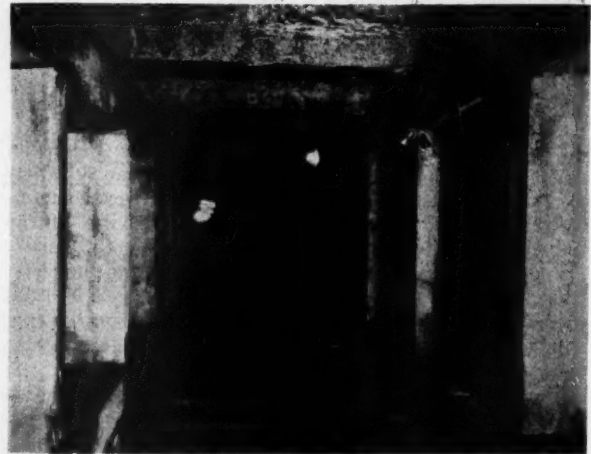


DIAGRAM SECTION OF THE NEW AND OLD TUNNELS

posts, caps and lagging. All faces had to be breasted and considerable excelsior and burlap were used to prevent leakage. Longitudinal timbers or crown bars were then put into place under the caps on either side and propped up from the high line frame, after which planks were driven laterally and in a slightly downward direction over the tops of these crown bars into the material on either side. Then a second set of crown bars was placed in position near the ends of the first set of planks, as shown in the sketch, to be followed by a third and a

fourth set, until the complete arch was turned. These crown bars were supported by a series of struts bearing on the bents of the high line. As soon as practicable after the completion of a section of the tunnel timbering segments of the new timber lining were put into place with their ends bearing on the tops of the concrete side walls. The crown bars were propped up on these arch ribs so that the temporary struts could be removed. The segmental ribs consisted of 12-in. by 12-in. timbers and



CROWN BARS IN THE HEADING

were spaced 2 to 6 ft. apart; about 700 ft. of lumber were used per foot of tunnel.

Although the utmost care was exercised in conducting the tunnel work, an average of 1 cu. yd. of dirt was lost per foot of tunnel, and as the overburden was small this caused a material settlement of the ground surface above. The typical condition is shown in one of the photographs where a settlement of about a foot is apparent. At one place, however, the subsidence was four feet.



GASOLENE LOCOMOTIVE ON THE HIGH LINE

The tunneling was carried on at four faces, each of which was worked by three shifts of 42 men and two foremen each. In the drift, which was commonly carried about 100 ft. ahead of the full timbering, a crew of five men was employed. These were followed by 13 miners and 13 helpers engaged in making the enlargements on each side. They in turn were followed by 16 men employed in putting in the arch ribs and blocking. With gangs organized in this manner the best progress from

one face for a period of 30 days was 1,003 ft. of completed heading.

UNUSUAL CONCRETE PLANT

Collapsible forms equipped with rollers to permit ready removal and reuse were used for the concrete work throughout. A portion of the forms used for the side walls was constructed of timber, but most of the forms, including all of those used in the arch construction, were Blaw steel forms. The form equipment consisted of 120 lin. ft. of wooden forms and 180 lin. ft. of the Blaw forms. The concrete was placed in 30-ft. sections, except that the form for the key of the arch was made in 10-ft. lengths to facilitate the concreting of the key.

A main material yard was installed at the north portal of the tunnel, where a clam-shell bucket was operated by a stiff-legged derrick on a platform over the main track to unload sand and gravel from gondola cars into an elevated storage bin. A concrete mixer, placed in a convenient position under the bin so that the sand and gravel could be chuted directly into charging hopper, supplied concrete to 2-ft. gage Koppel cars that were hauled into the tunnel by two 7-ton Milwaukee gas-driven loco-



A CONCRETE PLANT OVER THE TUNNEL

motives. This concrete plant, which is shown at the head of this article, and a similar one at the south portal, supplied all of the concrete for the invert.

The concrete for the side walls and arch was provided by an entirely different system. Owing to the small overburden and the comparative uniformity of the ground surface, together with the ready accessibility of the ground directly over the tunnel, a novel plan was devised for delivering the concrete to the forms. A 36-in. gage track was laid with an easy grade from the material bins at the north portal, up the hill to the ground surface over the tunnel. This track was used by four-yard dump cars hauling sand and gravel and small flat cars carrying sacks of cement, which were handled by two 18-ton Porter steam locomotives. These concrete materials were delivered to four concrete mixers located alongside the track at convenient intervals with their discharge openings placed directly over the tops of shafts driven to the top of the tunnel, where concrete discharged from the mixers was received in small cars running on a 2-ft. gage track on the high line of the tunnel. These small cars were handled to the place of concreting by two 3½-ton Bell gas-fired steam locomotives. The concrete for the side walls was spouted directly into the form, but that for the arch had to be shoveled into place. The concrete for the side walls and arch was a 1:2:4 mix-

ture and that for the invert a 1:3:5, 6.1 cu. yd. being required per lineal foot of tunnel. The concrete mixers were all ½-cu. yd. Smith mixers. Another important factor in the plant equipment was a power saw operated by a 15-hp. motor, which was employed in the preparation of the tunnel timbering. Some of these timbers were handled through the shafts that were used to supply the concrete. The tunnel was lighted by incandescent electric lights placed at intervals along the walls.

Owing to the fact that the contract called for the completion of reconstruction work a year from the date of starting, every effort was made to rush the work and as many as 1,250 men were employed at one time. In the concreting of the arch 220 men were employed in two 8-hour shifts of 110 men each, with a maximum progress of 700 lin. ft. of completed arch per week. The work on the tunnel was interrupted by a strike that lasted from May 1 to July 10, but the new lining was completed without difficulty by December 15, 1916, and the operation of trains was resumed on December 25.

CANADIAN FLAGGING RULES

THE Board of Railway Commissioners of Canada has issued regulations for the uniform flagging of the track by the maintenance of way department which became effective on all the railways of Canada on June 1, 1917. These rules are also of general interest to railway men in the United States and are published below.

1. Before undertaking any work which will render the track impassable, or if rendered impassable from any cause or defect, trackmen, bridgemen, or other employees of the company shall protect the same as follows:

2. (a). On double track; (b) on three or more tracks; (c) in mountain territory; and (d) on all lines with frequent or fast train service—Send out a flagman in each direction with stop signals, at least 1,500 ft. in daytime, if there is no down grade toward the obstruction within one mile, and there is a clear view of 6,000 ft. from an approaching train; 3,600 ft. at other times and places, if there is no down grade toward the obstruction within one mile; 5,400 ft. if there is a down grade toward the obstruction within one mile. The flagman must, after going the required distance from the obstruction to insure full protection, take up a position where there will be an unobstructed view of him from an approaching train of, if possible, 1,500 ft., first placing two torpedoes on the rail (not more than 200 nor less than 100 ft. apart), on the same side as the engineer of an approaching train, 300 ft. beyond such position. The flagman must display a red flag by day and a red light by night, and remain in such position until recalled or relieved.

3. On other lines, (a) By day place a red flag and, in addition, by night a red light, on the same side of the track as the engineer of an approaching train, at a point 600 ft. from the defective or working point, with two torpedoes placed on the rail opposite each other so as to cause but one explosion, 150 ft. in advance of the red signal, and provide further protection as follows: (b) By day place a red flag, supported on two staffs with flag drawn out between them at right angles to the track and 5 ft. above rail level; and, in addition, by night, a red light; on the same side of the track as the engineer of an approaching train so that it will be clearly in his view, at least 3,600 ft. from the defective or working point, if there is no down grade toward the obstruction; 5,400 ft. if there is a down grade within one mile of the obstruction, or as much farther as may be necessary to insure full protection. (c) Place two torpedoes (not more than 200 nor less than 100 ft. apart) on the rail on the same side as the engineer of an approaching train, 300 ft. in advance of the red signal.

4. Trains stopped by flagman, as per rule 2, shall be governed by his instructions and proceed to the working point, and there be governed by signal or instructions of the foreman in charge.

5. Trains stopped by red signal, as per rule 3, shall replace the torpedoes exploded and proceed to the working point signal, and there be governed by signal or instructions of the foreman in charge, unless in the meantime the stop signal had been removed.

6. In the event of train order protection being provided, the defective or working point may be marked by signals placed in both directions as follows: Yellow flags by day and in addi-

tion yellow lights by night, 3,600 ft. from the defective or working point; red flags by day, and in addition red lights by night, 600 ft. from the defective or working point, on the same side of the track as the engineer of an approaching train; except on double track, where trains run to left, in which case

signals shall be placed to the left hand side as seen by an engineer of an approaching train, and there is a clear view of at least 1,200 ft.

7. When weather or other conditions obscure day signals, night signals must be used in addition.

Solving the "Labor Turnover" Problem

BY DIVISION ENGINEER

SOME three hundred years ago there came to this continent the nucleus of what is now the greatest nation on the face of the earth. As success and prosperity crowned their efforts, the ambitious ones rose above the shirkers from the level of ordinary labor, leaving the shirkers to perform the more arduous and physical work of the pioneer. This resulted in the first decline of efficiency in labor and created the need of men to fill the places of those who had advanced beyond the laboring class. Others came and relieved the situation for a period until they, too, had classified themselves, and as history repeated itself, each race follows in the footsteps of those who had gone before, gradually classifying itself, leaving its proportion of shirkers to join the army of restless wanderers.

This phenomenon was in progress when the European war shut off emigration. The conditions have not been improved by the recent act of Congress which practically forces the classification of various races before entering the country.

The shirker of the early days is by no means altogether responsible for his present condition. Little was done to change or direct his pathway, but instead the most extravagant advantage was taken of the immigrant. The environment of the laborer was given little or no thought, his comfort and means of education were not considered, his welfare was left to the discretion of the old-time, heartless, burly "straw-boss," who obtained results solely by driving, which naturally resulted in breeding contempt and hatred in the heart of the laborer.

It is needless to go further into detail, as much has been done in the past few years to remedy the situation by the improvement of sanitary living conditions, educational facilities, methods and control of discipline, invention of machinery, the correction of mental and physical infirmities, the increasing of wages and the bonus system. However, not much has been accomplished in the regulation of output and the establishment of permanent forces, and in no department of railways is there better opportunity to introduce this measure than in maintenance of way work. Permanent forces, of course, mean the elimination of temporary and extra forces, so far as maintenance work and also much of the small construction work is concerned.

Suppose the ordinary section were permitted to maintain a permanent force of 12 men the year around instead of from 4 to 6 during the winter months and from 8 to 10 during the summer months, as at present; one of the men to be an apprentice or assistant foreman. Each man would then be considered a permanent employee, entitled to all the privileges granted to such employees. The advantage of standard discipline methods insuring fair treatment, practically a guaranteed income, free transportation when desired, permanent headquarters which mean a home, the chance for promotion, his employer's opportunity to study him, thus giving him the advantage of his inclination, a higher plane of social environment, collateral for credit to his advantage for the

investment of savings—all these would result in his better physical and mental condition and, on the whole, would be an inducement to remain in the service.

During the summer months when heavy maintenance work is carried on, these gangs could be combined, leaving one or two men on each section to look after emergencies. Three combined section forces would give a gang of 30 experienced men with plenty of expert supervision. The period is rapidly approaching when all section gangs will be provided with motor cars, and the men thus transported to and from work without difficulty or loss of time. The argument that these men would accomplish more work of a much higher standard of workmanship than a temporary extra gang will meet with little opposition.

These men would monopolize little of the foremen's time for individual instruction as compared with the temporary or extra men, thus giving the foremen more time properly to supervise and plan their work. The permanent man places a greater value on his job and on the property of the company. He will be familiar with the rules and instructions, will abide closer by them, develop into a skilled laborer, and make good material for a foreman.

It is well within the bounds of conservatism to say that these men could put up on stone ballast at least one mile on each of their sections, which means that on a division of 12 sections 12 miles of track could be ballasted each year, which is far above the present results, and the work would be performed to a much higher degree of perfection. In addition, it would not be difficult for these men to relay one mile of rail, a great deal of which could be laid during 9 or 10 months of the year, making 12 miles of rail if necessary.

Track work would advance from the status of common labor to practically skilled labor, where it rightfully belongs. The fact that this highly important and really scientific work is still looked upon as in days gone by as ordinary labor, is robbing the foremen and the men of the respect that belongs to them in their place among skilled labor, and is driving them from this class of work.

Men would always be available during the winter for handling snow, cinders for storage, for washouts and wrecks; and much rail laying could be done during the winter when the ground is frozen. These men would soon develop sufficient skill so that each section could maintain its own signals, build fences and place crossing plank, for which oftentimes carpenter forces are used. The maintenance of water stations could also be handled under the supervision of the section foreman. Thus signal, carpenter and water service forces would be reduced, effecting a saving, part of which should be used for the better compensation of the track forces raised to the class of skilled labor.

With the elimination of the expense of housing extra gangs, the employment of camp men, flunkies, cooks, timekeepers, extra foremen and assistant foremen, it fol-

lows that the nuisance of burdening passenger trains each day with laborers and provisions would be abolished. There is little doubt that permanent forces would handle their work with less delays to trains than extra and inexperienced forces which monopolize the foremen's attention. Experience develops that in emergency cases the regular forces respond to call at all times, while "hobo" and extra gang laborers have been found unreliable in these cases and almost always demand extra compensation. It would be difficult to estimate the saving in tools effected, and also the shipping of them back and forth from the stores department. This system would tend to simplify the work of division and supervising officers and eliminate considerable clerical and office work in both division and general offices, thus doing away with

extra payrolls, board deductions and innumerable pay certificates at each pay day.

The use of intoxicants could be entirely stamped out. The competition of former days, when each man was master of his work and took pride in outdoing his fellow worker, would soon be restored, and eventually the gap between employer and employee would be closed, bringing back that old-time loyalty when men would fight for the company.

The evils of the rapid turnover of men must be met. The changes to be made must seemingly be radical, and while railroads are slow to take steps of this nature, procrastination surely means great waste of money and deterioration of property. At no time have such measures been so necessary as at present.

Power Driven Screw Spikes

IN laying the rail on the New York Connecting Railroad which is being built on Long Island jointly by the New York, New Haven and Hartford and the Pennsylvania, to provide a direct passenger connection between the two roads, as well as to shorten the car ferry service for the interchange of freight, particular interest is attached both to the track structure and the methods followed in placing the screw spikes. The 26 miles of track is being laid with the Pennsylvania standard 125-lb. rail on tie plates 14 in. long by 7 in. wide and $\frac{11}{16}$ in. thick. The plates and rail are held in position by two different types of screw spikes, those holding the plates being about $5\frac{1}{2}$ in. long underneath the head by $\frac{3}{4}$ in. diameter, and those holding the rail being about $6\frac{1}{2}$ in. long under the head by $\frac{7}{8}$ in. diam-

of 100 r. p. m. and consume about 55 cu. ft. of air per minute. The air for the drills is furnished at 100-lb. pressure by Ingersoll-Rand Imperial type Duplex gasoline-driven compressors. The compressors are portable, being easily moved by two or three men as the work progresses. They have a piston displacement of 140 cu.



THE COMPRESSORS MOUNTED ON WHEELS

eter. Six spikes are used at each end of a tie, 4 to hold the plate and 2 the rail.

The spikes are being seated pneumatically by Ingersoll-Rand "Little David" reversible drills, equipped with a special clutch and wrench, made in one piece and geared for low speed. The drills are compound geared, weigh 70 lb., have an average speed at 90-lb. pressure

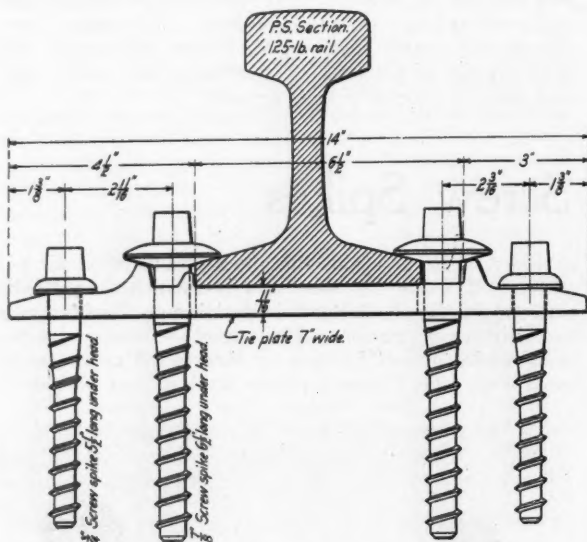


TWO MEN DRIVE THE SPIKES

ft. of free air per minute, weigh about 5,600 lb. each and run at full load with an average consumption of $2\frac{1}{2}$ gal. of gasoline per hour. Each compressor supplies air to two spike driving machines and a wood boring machine.

In laying the track, the rail, plates and ties are placed ahead of the spiking gang, all joints are completed and the ties are bored in advance with $\frac{5}{16}$ -in. holes for the tie plate spikes and $\frac{7}{8}$ -in. holes for the rail spikes. The organization for each compressor unit consists of 12 men, one to operate the compressor, one the wood boring

machine, two for each of the spike driving machines and six laborers who are equipped with lining bars and sledge hammers. The spikes are placed ahead of the drills by hand and are given a turn by a hand wrench, just sufficient to hold them in place when the drill is applied. The spike driving machines are so powerful that it is necessary to hold the tie in place with bars as the spikes are run in, to prevent the tie from turning. The wood boring machines are furnished to prepare the spike holes at the joints where tie plates are not used and for cases



THE RAIL, TIE PLATE AND SCREW SPIKES

where the pre-bored holes do not line up with the holes of the tie plates.

Working a 10-hour day, each spiking gang will place the spikes in approximately 600 ft. of track at a cost per spike of \$0.008 per spike or less than 10 cents for the 12 spikes in each tie. The track laying is being done by P. McManus, Inc., of Philadelphia. The compressors and drills were furnished by the Ingersoll-Rand Company of New York.

HYDRATED LIME IN CONCRETE

DURING the past three years much has been written about the value of using small percentages of hydrated lime in concrete construction. It has been claimed that the mechanical influence which hydrated lime exercised over concrete mixtures by introducing greater plasticity into the mixture resulted in a more freely flowing mixture through chutes without excess water and that, upon being deposited in the forms, it could be spaded around reinforcing steel much more freely; the mixture could be placed in the field with less mixing water than is ordinarily used, thus automatically giving a higher strength by reason of the elimination of segregation; and that the concrete in its hardened form would be of maximum density and water tight. In fact, there were good reasons for believing that hydrated lime judiciously used in concrete mixtures would serve an excellent purpose.

A little over a year ago when the structures on the new Indianapolis & Frankfort railroad extending from Ben Davis to Frankfort, Ind., were being designed by the Vandalia, the value of hydrated lime was seriously considered and it was decided by the engineering depart-

ment to give it a thorough trial to demonstrate its effectiveness and economy. Over the entire distance of the new road, approximately 41 miles, there is a total of 42 bridges of various types, each containing from 300 to 1,500 cu. yd. of concrete.

The contractors, Dunn & McCarthy Company, Chicago, up to this time had placed all of the concrete by means of a tower. It is interesting to note here that about ten of the bridges are located at public highways when a good supply of water could not be obtained except at considerable expense.

The quantity of hydrated lime specified to be used was 10 per cent by weight of the cement content for each batch of concrete. To make the method of incorporating it as convenient as possible a box about 3 ft. square and 2 ft. 6 in. deep was kept alongside the mixer with sufficient hydrate in the box to meet immediate needs. As the proportions of cement, sand and gravel for a three-bag batch were placed in the loading hopper, two 12-qt. pailfuls of lime were placed in the hopper on top of the dry materials. This mixture was then emptied into the mixing drum and mixed in the usual manner.

The first fact noticeable from the use of hydrated lime was that the mixture flowed much more freely through the chutes, and this was accomplished with the use of considerably less water than is ordinarily required. In view of the present agitation to avoid an excess of water in concrete, the fact that the use of lime made it possible to reduce the quantity of water was recognized as a factor that would tend to increase the strength of the concrete.

The next noticeable effect was after the concrete mixture had been deposited in the forms. The increased plasticity which has been introduced into the mixture by the lime with less water was found to permit the concrete to be placed properly with a less amount of spading than that ordinarily required. Some of the flat top subways had complicated skew spans with corners that it was impossible to reach with a spade. The lime proved very successful in such places, as can be seen by the hardened concrete, preventing honeycombing and producing a smooth, uniform surface. The easier working of the concrete also resulted in a saving of about 50 per cent in the spading. The labor saved in cases where it was necessary to move the concrete some distance in the forms from the place where it had been deposited amounted to about 40 per cent.

Another noticeable effect of the lime was apparent upon removing the forms when it was found that it had been effective in eliminating segregation as was seen by the appearance of the surface, which was smooth and even and in which honeycombs and stone pockets were conspicuous by their absence. No extra labor after removing the forms was necessary for patching. The results where watertight concrete was desired have also been satisfactory.

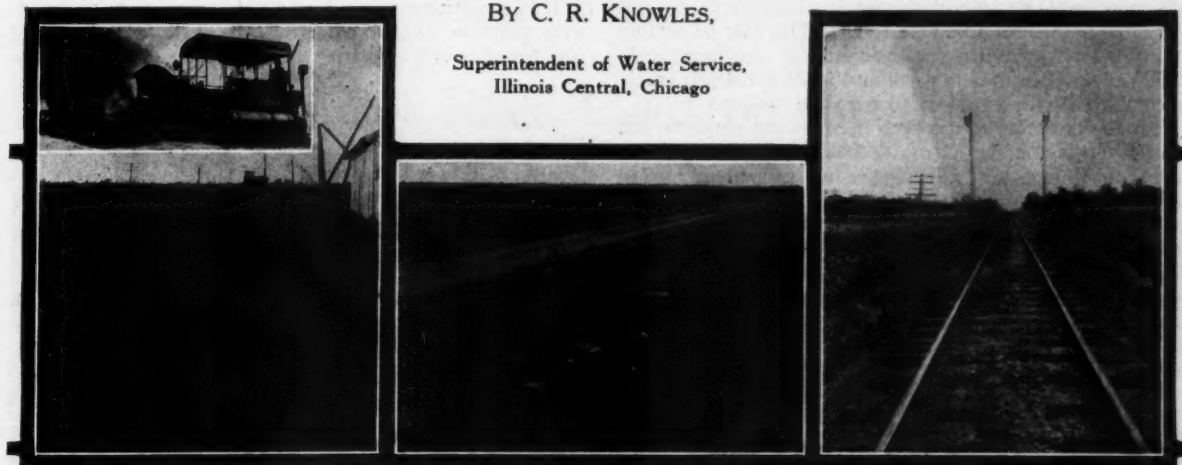
At the time of beginning this construction an order for 280 tons of hydrated lime was placed to be shipped as desired by the engineer in charge. After noticing the effect on the chuting and spading of the concrete, the lesser amount of water required, the labor saved, and the appearance of the finished concrete, it was decided to use lime in other parts of the structures where it had not been specified originally, involving an additional purchase of 300 tons. It is stated that the cost of the 580 tons of hydrated lime used has been largely compensated by the labor saved. The work was under the direction of F. T. Hatch, chief engineer, and H. T. Whitney, engineer in charge.

REMOVING WEEDS FROM TRACK BY BURNING

The Method Followed on the Illinois Central in Removing Dense Vegetation on Its Southern Lines, with Cost Figures

BY C. R. KNOWLES,

Superintendent of Water Service,
Illinois Central, Chicago



The Original Condition

After One Burning

The Clean Track

VEGETATION growing on the right-of-way is objectionable, for the reason that it increases maintenance expenses, communicates and spreads fires, obstructs the view and interferes with telegraph and telephone lines. The elimination of vegetation on the roadbed proper reduces maintenance expenses, affords better drainage for the ballast, prolongs the life of ties and gives a better view of track conditions. Vegetation growing in side tracks is crushed on the rail by the drivers of locomotives and causes them to slip, making it very difficult to handle cars in and out of weed-infested sidings. The most troublesome species of vegetation are Bermuda grass, Johnson grass, crab grass, horsetail and sweet clover.

The annual expense of keeping the right-of-way and roadbed clear of vegetation per mile of road is about \$70.00, which represents a little more than four per cent of the total average annual cost per mile for maintaining track and structures. The most common methods employed in keeping the right-of-way and track clear of weeds are the use of teams with mowing machines, and men with scythes and weeding by hand. Much of the grassing of track is done with shovels, especially between ties. This disturbs the ballast, and while it removes the grass and weeds temporarily, it has a tendency to promote future growth through cultivation. On some of our lines it is necessary to cut the right-of-way and grass the track but once a year, while on other lines, especially in the south, the weeds grow so rapidly that it is found necessary to remove them twice a year. When it is necessary to cut the right-of-way twice a year the first cutting is done late in the spring and the second cutting early in the fall. The effectiveness of such treatment is only temporary and it is necessary to repeat the performance year after year. It is impossible to give the cost of any of the above methods singly, as the work is not done entirely by any single method. Some of the track on southern lines where the growth of Bermuda grass is heavy will cost from \$25 to \$40 per mile to clear a 14-ft. strip. If only a few weeds and little grass is on the track it will cost from \$12 to \$15 per mile, while on rock

ballast and washed river gravel the cost will amount to from \$60 to \$80 per mile, as a large amount of the grass and weeds on this class of track will have to be pulled by hand, which is very slow work. Numerous experiments have been made with various chemicals designed to kill weeds, most of these weed killers being arsenical compounds. Conflicting reports have been made as to the merits of these compounds, but there is no doubt that some of them are effective, especially on quack grass and other shallow-rooted vegetation. The cost and effective-



READY TO START THE BURNER

ness of chemicals will depend largely on whether the vegetation is rank or otherwise, the cost being from \$15 to \$100 per mile. The cost of treatment will also vary greatly, according to the width of the strip treated, the character and density of the weeds and weather conditions. One serious objection to the use of many of the chemicals for destroying weeds has been the fact that they are poisonous and injurious to live stock which come in contact with the chemicals while grazing on the right-of-way. This has tended to limit the general use of these chemicals to territories where there was little possibility of live stock reaching them. A repellent compound has been designed to prevent live stock from grazing on the treated area which is claimed to be effective. This odor

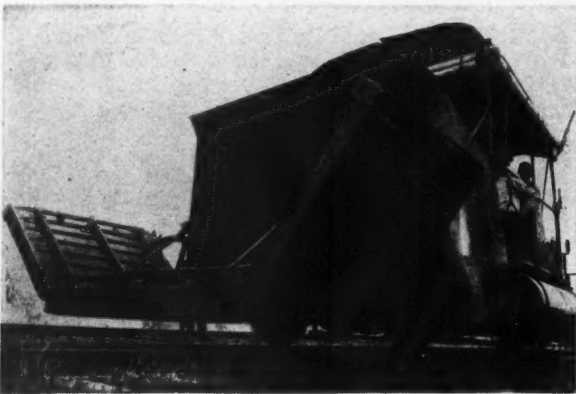
compound, as it is called, is applied immediately after the application of the weed killing chemical.

Mowing machines attached to motor cars are being used successfully for mowing the right-of-way on several divisions. This machine mows a swath 6 ft. wide, starting about 4 ft. from the gage side of the rail. It will mow only one side of the track on double track, but will mow both sides on single track. The cost of cutting the right-of-way with this machine is approximately \$1.50 per mile for double track and \$1.25 for single track, as compared with a cost of \$3 per mile by hand.

It is the intention to use both the mowing machine and a weed burner on the Yazoo & Mississippi Valley south of Baton Rouge, first cutting the weeds and then running the burner over the same territory after the weeds have dried sufficiently to burn. By this method a swath will be cleared 24 ft. wide at a cost of but little, if any, more than burning a 14-ft. strip, for the reason that the dead weeds will assist in the combustion of the green weeds, thereby reducing the amount of oil required for burning sufficiently to offset the cost of operating the mowing machine.

A weed burner has been operated over the lines of the Yazoo & Mississippi Valley between Vicksburg, Miss., and New Orleans, La., for the past four years, with very satisfactory results. The vegetation in this territory is very heavy, especially south of Baton Rouge. In fact, such good results have been obtained from the use of this burner that the second burner has been purchased and will be placed in service north of Vicksburg.

The machine used for burning weeds is known as the Commonwealth weed burner. It is constructed entirely of steel and iron, as the heat is so intense that any wood-work would catch fire. The main frame or bedplate is a single steel casting comprising the center, side and end sills, transoms, engine foundation and floor, all in one piece. All other parts of the machine are attached to this



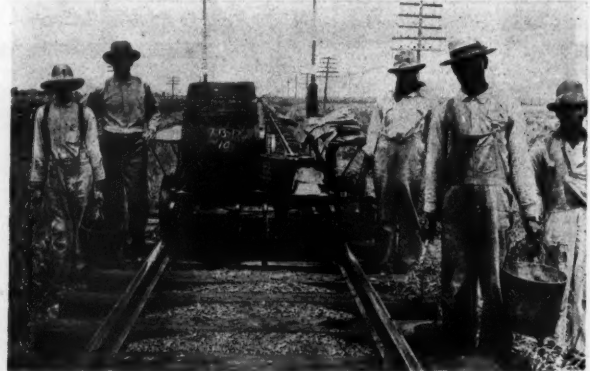
WINGS RAISED TO SHOW LOCATION OF BURNERS

bedplate. The machine is self-propelling, being equipped with a 60-hp., three-cylinder, reversible air-starting engine. It is also equipped with an air pump driven from the main shaft of the engine to operate the air brakes and force the oil to the burners. The side, or wing burners, are also raised and lowered by means of air cylinders. The wing burners work independently of each other and can be raised or lowered quickly to clear wing fences, bridges, etc., and can also be adjusted to bank slopes. The machine is designed for a slow speed of 3 to 4 miles per hour while burning weeds and a high speed of 15 to 20 miles per hour when going to and from work.

Two burnings are necessary to destroy weeds by this

method. The weed burner is first passed over the weeds and the intense heat kills the plant life. The weeds soon wilt down and after a day or two of dry weather they are dried out sufficiently to furnish fuel to assist in their own combustion when the weed burner passes over them the second time.

This equipment was originally designed to burn weeds with gasoline, but by changing the burners and coils it was found possible to use a less expensive oil than gaso-



PUTTING OUT FIRES IN TIES

line. The oil now being used for burning is a distillate or fuel oil having a specific gravity of from 30 to 32 deg. Baume and is much cheaper than gasoline. The oil tanks have a capacity of 480 gal. and will burn from 10 to 15 miles, the consumption of oil depending on the density of the vegetation. The engine of the first burner is operated on gasoline, but that on the new burner is designed to run on the same oil used for burning.

The weed burners are provided with cars for taking care of the crew, trainmen, supplies, etc. This outfit consists of one combination kitchen and dining car, one bunk car with six bunks, one tool and supply car and a tank car for oil. The machine requires a crew of two men to operate it in addition to the train crew, which usually consists of a conductor and flagman. A motor car follows the burner with section men to extinguish small fires in ties, etc. The fire-extinguishing crew is provided with water buckets and a barrel of water is carried on the car. A swab is used for extinguishing fires in ties, as it is more effective than the dashing of water on the ties and requires much less water. This crew follows immediately behind the burner, extinguishing all visible fires. One man remains about an hour behind this crew to guard against any fires that may be overlooked gaining headway in bridges, etc. Very little trouble has been experienced from fires caused by the burner, though it is inadvisable to burn during a high wind or after a prolonged period of dry weather, on account of the possibility of a fire spreading. As a precaution against bridge fires, two 5-gal. chemical extinguishers are carried on the machine, with 12 extra charges. A water barrel, with two fire buckets, is also provided. The cost for two burnings is from \$10 to \$12 per mile; the expense for 163 miles is as follows:

Gasoline used, 205 gal.....	\$ 46.11
Fuel oil used, 6,500 gal.....	292.00
Other supplies	15.90
Wages of train crews.....	184.90
Wages, weed burner crew.....	271.20..
Wages, section men.....	153.15

\$963.26

Cost per mile..... 5.90

During this period the machine actually worked only 57 per cent of the time, owing to delays on account of rain, train delays, high winds and stops to make repairs to the machine.

The importance of labor-saving devices for removing weeds from right-of-way is more apparent with the increasing scarcity and price of labor. There is no doubt that motor-car mowing machines and weed burners take

the place of a large amount of section labor. Under present labor conditions their use would appear to be advisable even though the cost of operating the machines equaled the expense of doing the work by hand. As a matter of fact, the use of the machines has proved that they earn a very satisfactory return on the investment in addition to conserving section labor for the maintenance of track.

A History of Rails Used on the Southern

THE accompanying half-tone was prepared from a photograph of an interesting collection of rails in the possession of B. Herman, chief engineer maintenance of way and structures, Southern railway, lines east, at Charlotte, N. C. Cross sections sawed from these rails were polished and mounted on a board in the order of the dates on which they were placed in service in tracks of the Southern or one of the many lines which now form a part of this system. Each section is numbered to facilitate its identification and is accompanied

1871. The rail weighs about 33 lb. per yd. and was spiked to stringers which were doweled to ties by white oak pins.

4. *Stringer Rail*.—Laid in tracks built in 1856 to 1871 by the old Macon & Brunswick between Macon, Ga., and Brunswick. It was released about 1878. The rails were about 24 ft. long and were spiked to 7-in. by 8-in. stringers doweled to 6-in. by 8-in. and 6-in. by 9 in. by 9 ft., dapped ties, spaced about 4 ft. apart.

5. *Hollow U-Shaped Rail*.—Invented in the United



THIRTY-EIGHT SECTIONS OF RAIL WHICH HAVE BEEN USED ON THE SOUTHERN

with a description that has been prepared giving the best available information concerning each section of rail. These descriptions appear below:

1. *Strap or Stringer Rail*.—Length of service unknown. Laid between Charleston, S. C., and Branchville, by the old South Carolina Canal & Railroad Company about 1835, on wooden stringers and without couplings.

2. *Stringer Rail*.—Replaced rail No. 1 between Charleston and Branchville. The date of laying and length of service are unknown.

3. *Stringer Rail*.—Used between Charlotte, N. C., and Columbia in the tracks of the old Charlotte & South Carolina, built in 1846 and 1852. This rail was transferred to the Winston-Salem division, where it was used until

States by Strickland in 1834, weighs 40 lb. per yard. and was 10 to 20 ft. long. It is supposed to have been used between Alexandria, Va., and Orange, when the old Orange & Alexandria was built in 1848 to 1852, and was relaid in side tracks and yards after 1874. The specimen shown was taken from the Alexandria shop yard in December, 1914.

6. *Hollow U-Shaped Rail*.—Replaced rail No. 2 between Charleston and Augusta. The date of laying and length of service are unknown.

7. *T-Rail*.—Weight 40 lb. per yard. It was made in lengths of 18 to 24 ft. and was used in the main track of the Washington division as late as 1875. The date of laying is unknown.

8. *Pear-Shaped Rail*.—Weight 45 lb. per yard. It was laid just after the Civil War by the Atlanta, Tennessee & Ohio between Charlotte, N. C., and Statesville, and was entirely released in 1896.

9. *Pear-Shaped Rail*.—It was laid with chairs as shown by the specimen. It replaced rail No. 6 between Charleston and Augusta. The date of laying, length of service and weight are unknown.

10. *Pear-Shaped Rail*.—Released from service in side tracks on the Birmingham division. The date of laying, length of service and weight are unknown.

11. *Pear-Shaped English Rail*.—Weight about 50 lb. and marked "John Brown." It was laid about 1880 between Strasburg and Harrisonburg, Va. The length of service is unknown.

12. *Pear-Shaped Rail*.—Marked "50-lb. A. T. Co. 1867." Released from Charlotte division. The original location and length of service are unknown.

13. *Pear-Shaped Rail*.—Marked "56-lb John Brown, August, 1873." Released from the Charlotte division. The original location and length of service are unknown.

14. *Pear-Shaped Rail*.—Marked "56-lb. John Brown, 1872." Probably laid first on the Asheville division.

15. *Pear-Shaped Rail*.—Weight and history unknown. Winston-Salem division.

16. *Pear-Shaped Rail*.—Weight about 60 lb. per yard. Made by Rhymey & Co., date unknown. It was in the main tracks of the old Alabama Central & Selma and the Rome & Dalton, between Dalton, Ga., and York, Ala.

17. *Pear-Shaped Rail*.—Weight 56 lb. per yard. It was laid about 1876 on the Washington division.

18. *"Booth" 54-lb. Steel-Capped T-Rail*.—One-fourth in. of crucible steel was rolled onto a wrought iron head and stem. It was used between Statesville, N. C., and Taylorsville, by the old Statesville & Western, about 1887.

19. *T-Rail*.—Marked "54-lb. B. I. Co., 1880." Laid in 1880 in the old Alabama Central & Selma and the Rome & Dalton, between Dalton, Ga., and Selma, Ala.

20. *T-Rail*.—Weight 25 lb. per yard. Laid in 1885 on the Atlantic & Danville between Claremont Wharf, Va., and Emporia.

21. *T-Rail*.—Weight 30 lb. per yard. Same history as No. 20.

22. *T-Rail*.—Marked "40 lb. Am. Iron Co., 1878." Replaced rail No. 4 between Macon and Brunswick, Ga.

23. *T-Rail*.—Weight 35 lb. per yard. Same history as No. 20. Some 35-lb. rail, marked "I. R. M. Co.," was used in 1881, probably on the Lawrenceville branch.

24. *T-Rail*.—Marked "40 lb. A. C. O. Z. Co., 1880." Released from an industrial track on the Charlotte division. Rail of this weight was used in the main track of the Asheville division from about 1870 to 1880 and in side tracks until 1903.

25. *T-Rail*.—Weight 45 lb. per yard. Rolled about 1870. Used in main tracks on the Asheville division until 1880; in side tracks until 1903 and in the circular track of the Asheville turn-table until 1913.

26. *T-Rail*.—Marked "50 lb. Penna. Steel Co., 1878." Laid by the Richmond & Danville between Selma, N. C., and Goldsboro.

27. *T-Rail*.—Marked "50 lb. Penna. Steel Co., 1878." Place of original installation is unknown. Used probably as relay rail between Toccoa, Ga., and Elbelton.

28. *T-Rail*.—Marked "54 lb. C. P. Co., Ld., 1881." It was laid in the main track of the Northern Alabama in 1884, and relaid in side tracks in 1887.

29. *T-Rail*.—Weight 56 lb. Laid in the main track between Alexandria, Va., and Orange, in 1878, between

Rome, Ga., and Cleveland, Tenn., by the Selma, Rome & Dalton, and between Warrentonville, S. C., and Hamburg, in 1877.

30. *T-Rail*.—Weight 52 lb. per yard. Laid in 1888 by the Atlantic & Danville between Norfolk, Va., and Danville, and still in service.

31. *T-Rail*.—Marked "54 lb., B. I. Co., 1882." Laid in the main track at mile post 49 on the Northern Alabama, in 1900 and released in 1910.

32. *T-Rail*.—56 lb. Carnegie rail, laid in 1888 by the Atlantic & Danville in the main track between Norfolk, Va., and Danville, and still in use.

33. *T-Rail*.—Marked "60 lb. P. S. Co., 1899." Laid the same year on the Winston-Salem division and still in use.

34. *T-Rail*.—Marked "67 lb. E. T., 1892." Laid between Huntingburg, Ind., and Birdseye, in 1892, and since then released and placed in side and passing tracks.

35. *T-Rail*.—Marked "70 lb. E. T., 1891." Laid by the Richmond & Danville in the track of the North Carolina railroad between Greensboro, N. C., and Goldsboro.

36. *T-Rail*.—Marked "75 lb. A. S. C. E." Used first about 1894 on the Macon & Brunswick between Macon and Brunswick, and on the East Tennessee, Virginia & Georgia, between Knoxville and Chattanooga.

37. *T-Rail*.—80 lb. A. S. C. E. First laid in 1894 on the Virginia Midland between Alexandria, Va., and Orange.

38. *T-Rail*.—85 lb. A. S. C. E. Carnegie Steel Co. Laid in the double track between Nokesville, Va., and Culpeper, the latter part of 1903.

RAILWAY STATISTICS FOR 1916

THE Interstate Commerce Commission has issued a preliminary abstract of the statistics of railway operations for the year ending June 30, 1916. The roads included in this report represent an aggregate length of 259,210.86 miles of line. The mileage of railway tracks of all kinds is classified as follows:

Item.	Total.
Miles of road	259,210.86
Miles of second main track.....	28,935.21
Miles of third main track.....	2,730.62
Miles of fourth main track.....	1,960.00
Miles of all other main tracks.....	238.34
Miles of yard track and sidings.....	101,869.23
Miles of all tracks.....	394,944.26

The equipment statistics contain the following interesting facts: There are 63,862 locomotives, 54,664 cars in passenger service, and 2,326,987 cars in freight service, of which 1,024,418 are box cars and 899,638 are coal cars. Statistics gathered from roads having a total length of 258,670 miles show that the average number of employees in service during the year was 1,654,075, for whom the total compensation was \$1,403,968,437. The total capitalization of the railroads at the par value of the securities was \$21,092,372,245, of which \$9,058,982,733 was stock and \$12,033,339,512 was funded debt.

The railroads spent \$2,277,202,278 during the year for operating expenses, of which \$421,500,898 was spent for maintenance of way and structures. In addition to this an investment of \$41,835,894 was made during the year for new lines and extensions, while the expenditures for additions and betterments amounted to \$239,249,206. Since between 70 and 80 per cent of the latter amounts were expended on roadway and structures, it is seen that a total of over \$630,000,000 was spent during the year by the engineering and maintenance of way departments.



THE LAST BENT

portation from the extensive Utah coal fields to industries in Salt Lake, Idaho, Nevada and the north Pacific coast district. Smelters at Butte, Mont., are also largely dependent on Utah coal for the fuel necessary for these industries. In addition to the coal traffic, this line carries extensive merchandise freight into the territory west of the Wahsatch mountains in addition to its transcontinental business.

The location of the disaster and vicinity are shown in the map. The dam destroyed impounded the water of Mammoth reservoir in San Pete county and the flood waters in leaving their basin followed the natural drainage through Gooseberry creek, Fish creek and Price river. The Scofield branch of the Denver & Rio Grande follows Fish creek from Hale to Colton, near the point where Fish creek empties into Price river, while the main line of the road occupies Price canyon for a long distance. Eight or ten miles of the Scofield branch between Hale and Colton was practically destroyed, the damage within a distance of five miles being so complete



CONDITIONS AT CASTLE GATE

that entire reconstruction on a new alinement will be necessary in some places. Several steel girders on masonry abutments were seriously damaged either in the substructure, superstructure or both.

THE DAMAGE DONE

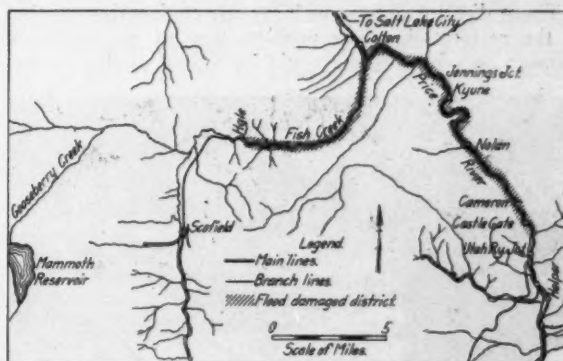
The damage on the main line occurred between Colton and a short distance south of Castle Gate. The bridges

EMERGENCY WORK AT A WASHOUT

The Manner in Which Twenty-five Miles of Denver & Rio Grande Line Were Repaired in Short Time

AN opportunity to evince the effectiveness of its organization and the resourcefulness of its men was afforded the Denver and Rio Grande recently in repairing the flood damage resulting from the failure of an irrigation dam in the state of Utah. Fifteen miles of double track main line and ten miles of branch line were put out of service, interrupting the heavy traffic on the main line of the road into Salt Lake City. This interruption was particularly serious because this line serves as the only means of trans-

ported on the main line consisted of double track steel girders on concrete masonry, comprising repeated crossings over the Price river. In addition to these steel structures, a pile trestle on the passing siding at Castle Gate was damaged and a bridge across the river leading to the tippie tracks of the Panther Coal Company was destroyed. At three of the steel structures most of the damage consisted in loss of the approach embankments and at the other two the destruction of the masonry substructure was almost complete. As the result, the girders were left in very bad position for restoring traffic quickly. At these two places, also, the approaches at one end or at the other were washed away, necessitating the



MAP OF THE FLOOD DISTRICT

construction of temporary trestles to open the line for through traffic.

At 20 places between Colton and Castle Gate the roadbed under either one or both main tracks was destroyed, allowing the tracks to drop into the holes or render train movement impossible. There were 19 of these washouts between Panther Junction and Kyune, a distance of a little over 10 miles. These washouts were from 350 to 750 ft. in length and varied from 10 to 30 ft. in depth. In Castle Gate yard alone there were five distinct and separate washouts of the roadbed, in two or three of which the track structure was demolished. The depot at Castle Gate, which was a small frame structure, was entirely destroyed, few parts being identified afterwards. The safe in the depot was found buried in the bed of the river about one-half mile below the depot site. The water supply at Castle Gate was put out of commission through the breaking of pipe lines and the destruction of the tank foundations. The surface workings of the Utah Fuel Company at Castle Gate suffered little damage, the principal loss being in the pump house and pipe lines.

The loss of the rolling equipment was practically nil. Two Mallet locomotives were caught between breaks of the main track just west of Cameron and had to be killed where they stood. Several other locomotives happened to be in the vicinity of Castle Gate, where there were also large numbers of freight cars, both loaded and empty. Through the prompt action of trainmen at this point all cars and locomotives were switched to points of safety, with the exception of five empty coal cars and two box cars loaded with coal. These went into the flood, but were subsequently recovered with little damage.

DIFFICULTIES OF RESTORATION

The interruption of traffic resulting from the breaks in the line was most critical, occurring just at this time, when the entire freight movement, both eastward and westward, was at flood tide. Another serious difficulty in connection with the occurrence lay in the fact that the interruption occurred near the westerly end of the line, thus necessitating a long movement of men and repair material. The only resources in stock for conducting repairs from the west end were those of the Salt Lake division, the other six divisions being east of the break. Still another fact which had to be considered in making temporary repairs was the weight of motive power required on this district. The maximum gradient of 2.4 per cent between Helper and Kyune necessitates the use of the heaviest Mallet locomotives (2-8-8-2), having a total weight of engine and tender of 629,000 lb. Therefore, temporary tracks had to be constructed more substantially than if lighter road power were used.

There did not appear to be much engineering needed in the restoration. The problem was to get a track through on which traffic could be moved at the earliest

bankment approaches. This difficulty was further increased by a considerable flow of water in the stream. The same general plan of opening the line prevailed in conducting the work at both easterly and westerly ends. The track was made passable for the pile drivers to proceed to the first openings necessitating the construction of wooden trestles. At these openings that track was



ONE APPROACH WASHED OUT



BOTH TRACKS WASHED OUT

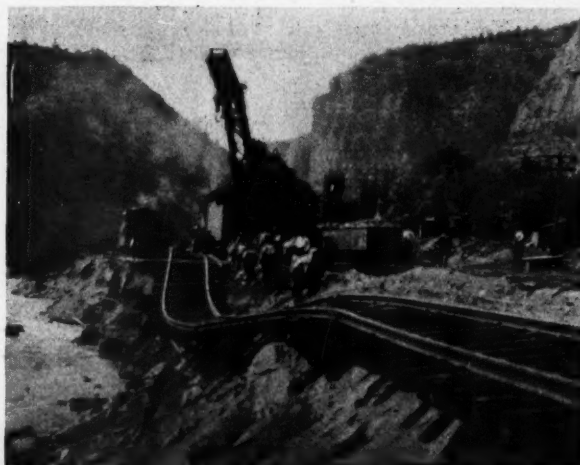
possible moment. Apparently it was simply a question of tackling the job in the most vigorous manner.

HOW REPAIRS WERE MADE

Bridge and track material was loaded at the several division points on the east and dispatched with utmost speed to the easterly end of the break. Similarly, material was rushed from the Salt Lake division to the westerly end. Such bridge gangs as could be spared temporarily from the Colorado divisions were immediately sent west, and likewise, all available men on the Salt Lake division were assembled at Colton and Kyune. One pile driver happened to be at Salt Lake City and another modern driver was sent from Pueblo. Men and tools were gathered up wherever available and transported by special trains to the scene of the work. A 100-ton wrecking crane started from Salida on the east and another from Salt Lake City on the west. All steam shovels and grading equipment which could be secured were also dispatched quickly to Castle Gate from the east or to Colton from the west.

The damage to the bridges over the river was such as to render impossible the filling of the demolished em-

selected which seemed to promise the quickest results. While the drivers were working at these temporary trestles all available men and grading equipment were utilized to repair the damaged roadbed at the next point in advance, either by filling or by the construction of a "shoo-fly" in one or the other of the two main tracks, so as to allow the drivers to proceed to the next bridge opening. This plan was carried forward until the two drivers, one working from either end, constructed a 250-ft. wooden restle at mile post 634, which formed the last link in the through track. The two main tracks were "shoo-flyed" from one to the other at different points where necessary to give a continuous through track. The



WRECKING CRANES WERE USED

two wrecking cranes were used in numerous ways, such as raising girders, shifting track, recovering material from the river, collecting and depositing large rocks for roadbed protection, etc.

A considerable handicap was felt because little or no railroad construction work was in progress in the vicinity and there was little grading equipment in the way of steam shovels and dump cars, available for use. This situation was still further aggravated by the fact that railroad labor was very scarce. However, advantage was

taken of the fact that, on account of the interruption to traffic, the coal mines in the vicinity could not work, and while temporarily closed down the miners were enlisted in reconstruction work and performed valuable aid, although inexperienced in this work.

The Scofield branch was attacked in somewhat the same manner, although the first vigorous efforts were concentrated on the main line. Having once established a through track on the main line, all energies were diverted to placing in commission the second main track, so indispensable to the volume of business conducted on this portion of the road. The last section of double track to be restored was between Castle Gate and Nolan, a



TRACK UNDERMINED ON A SIDE HILL

distance of five miles. Before this gap was closed single track operation was expedited somewhat by cutting in the intact portions of the second main track between breaks, thus making virtually long passing tracks. The best of the various expert estimates of from 15 to 30 days' interruption of traffic was discounted 50 per cent, for through trains were moving over the line in $7\frac{1}{2}$ days after the damage occurred. We are indebted to Arthur Ridgeway, assistant chief engineer of the Denver & Rio Grande, for the above information.

CAN A FOREMAN BE PROMOTED?

BY J. T. BOWSER

Queen & Crescent Route, Danville, Ky.

THE answer to this question lies largely with the foreman himself and his efforts. Good material for track supervisors and roadmasters is scarce. In fact, the filling of these positions with competent men is one of the problems which the railroad managements have to face at this time.

In his 12 years' experience in the maintenance of way department, the writer has taken a keen interest in section men and foremen. He has seen many promoted to better paying and more desirable positions, and has been fortunate enough to have been in a position to know the reasons for these promotions, and the reasons why others were passed over when selections were being made. He therefore feels qualified to speak with some authority on the subject, and also feels that what he has to say will be of value to those foremen whose ambition will not permit them to remain contented in their present positions.

In the first place, it may be assumed that the average

foreman is a fair track man or he would not hold his position long. But the man who is selected for promotion must be more than a fair track man, more than a good track man or even a very good track man. There must be that about him which will cause him to stand out above the crowd where he can be seen; something that will cause the officer who makes the selection to pause at his name as he checks the list of foremen, marking down timber for supervisory positions.

That attention compelling feature is—the evidence of thought. Whether one realizes it or not, his work, his methods, the way he handles his men, the manner in which he meets emergencies, the reports he makes, the letters he writes, and in fact everything he does, shows very clearly whether he is thinking or whether he is a routine man, simply doing thus and so because he has been told that that is the proper way, or because it has become a habit with him.

Constructive thought, planning ahead, investigating the "whys" of improper conditions, studying men, programming work, or directing to best advantage the use of the labor and materials, are the duties of supervising officers, it is true, but to some extent they are also the duties of the section foreman, and when a foreman's work begins to show signs of this kind of thinking, as it cannot fail to do, then is when that man begins to show above the routine men, and, consciously or unconsciously, he marks himself for promotion.

Track maintenance goes beyond mere routine, the surfacing and lining, the ballasting and dressing. Strictly speaking, track maintenance is repair work, but there is a better maintenance, constructive maintenance. Any ordinary track man can repair a bad place, put in a switch, line a curve, etc., but the thinking man searches for the condition which causes the bad place, learns the why of the rule-of-thumb method of putting in the switch and learns how to make his line very nearly perfect. An inexpensive cross-trench may drain a water pocket that is causing trouble, a well-planned ditch may drain a cut more effectively, or may divert water that is causing a soft place; a narrow place in a fill may be causing centerbound track or loss of elevation on a curve.

How much better to have these conditions permanently remedied instead of repairing the same places week after week and month after month, when one should be on other work.

To be sure, railroad managements have certain standards for work and certain methods of carrying out these standards, and supervising officers are supposed to see that the work is handled in the most advantageous manner, but there is plenty of latitude for the section foreman to do some independent thinking and acting. Operating conditions are changing constantly, equipment grows heavier each year, the demands on track are greater, material and standards change, the quality of the labor available for track work seems to be getting poorer, and the man who sees the new conditions brought about by these changes, and who changes his methods to meet them, is showing and developing the qualities which are required of the men in the higher positions.

In addition to track experience, these then are the qualities which are required of men for supervisory positions: The ability to think clearly, to see ahead, to plan work, and to carry out the plan; a mind open to suggestion from whatever source and capable of weighing these suggestions quickly and accurately; in short, foresight, initiative, and executive ability. Now is the time to develop these qualities and to apply them to

the work. Not only does their development and application give one a better chance for promotion, but the

chances for success in the advanced position are immeasurably increased.

Check List for Scale Inspection

THE United States Bureau of Standards has published a list of items to be noted in the inspection of a railroad track scale of the straight lever type. It is intended for use in connection with a standard scale inspection form proposed by the bureau for this purpose. The list is given below in a somewhat condensed form:

THE SECTIONS OF THE SCALE

Inspect both sides (beam and far) of each section in reference to the following points:

1. Main levers.
 - a. Is the lever loose when no load is on the platform?
 - b. Does the lever rub or touch any parts in such a manner as to cause binding or to interfere with the proper action of the lever?
 - c. Is the lever appreciably out of level and how much?
 - d. Knife-edges. Are the knife-edges worn flat or round, and how much? State width of flat part or radius of curvature.
What is the state of corrosion of the knife-edges—slight, advanced or excessive?
Are any of the knife-edges loose?
Should any of the knife-edges be replaced for the previously mentioned or other reasons?
 - e. Loops and bearings. Are the bearings out of their proper position? (Touching lever? Not centered on knife-edge?)
Are bearing steels worn, cut or broken?
What is the condition of corrosion of the active part of the bearings—slight, advanced or excessive?
Do the bearings contain foreign material? State what. If the loops are filled with cup grease, does it fail to prevent corrosion? Does it need replacing?
Do the bearings make uneven contact with the knife-edges they engage?
Do the bearing steels need replacing for any of the previously mentioned or other reasons?
Do parts of load bearing (main bearing) touch or interfere with angle-iron cross-bracing, foundation, or other obstructions?
Is the load-bearing casting or yoke poorly attached to or alined with the bridge girders?
2. Connection between the main lever and the extension lever.
 - a. Is connection out of plumb? State how much and in which direction?
 - b. Does the saddle block bind against extension lever?
 - c. Is the saddle block too far out on knife-edge?
 - d. Is the bearing steel worn, cut or broken?
 - e. What is the condition of corrosion of the bearing steels—slight, advanced or excessive?
3. Main lever stand.
 - a. Is the stand loose from the pier?
 - b. Is the stand out of alinement?
4. Foundations for main lever stand.
 - a. Is the foundation in an unsound or imperfect condition?
 - b. Does the foundation yield appreciably when load is applied?
5. Transverse checks.
 - a. Is the transverse check missing?
 - b. Is the check out of its proper level?
 - c. Is the check too tight or too loose?
6. Longitudinal checks.
 - a. Is the longitudinal check missing?
 - b. Is the check out of its proper level?
 - c. Is the sheet too tight or too loose?

EXTENSION LEVERS

1. Is the lever appreciably out of level and how much?
2. Does the lever rub or touch any parts in such a manner as to cause binding, or to interfere with the proper action of the lever?
3. Knife-edges.—Same as for main lever knife-edges.
4. Loops and Bearings.—Same as for main lever loops and bearings.
5. Connection to adjacent extension lever.
 - a. Is the connection out of plumb? State how much and in which direction.

6. Nose-irons.
 - a. Is nose-iron loose?
 - b. Is nose-iron rusted fast?
 - c. Is nose-iron in such a position that the knife-edge is twisted out of line; i. e., not perpendicular to the vertical plane of the lever?
 - d. Has nose-iron been shifted from the position determined by the factory mark? State how much in millimeters or hundredths of an inch, and whether it is shifted toward or away from the fulcrum knife-edge.
7. Extension Lever Stand.—Same as main lever stand.
8. Foundation for Extension Lever Stand.—Same as main lever Stand.

REVERSING LEVER OF FIVE AND SIX SECTION SCALES

1. a. Is the lever appreciably out of level, and how much?
b. Is the lever thrown appreciably out of level when the load is applied?
2. Does the lever rub or touch any of the following parts in such a manner as to cause binding, or to interfere with the normal action of the lever?
3. Knife-edges.—Same as main lever knife-edges.
4. Loops and bearings.
 - a to g, inclusive. Same as for main lever loops and bearings.
 - h. Are the loops for the fulcrum knife-edge at different heights?
5. Connection to adjacent extension lever.
 - a. Is the connection out of plumb? State how much and in which direction.
6. Anchorage of fulcrum.
 - a. Does the fulcrum anchorage give appreciably under load?

TRANSVERSE EXTENSION LEVER

1. Is the lever appreciably out of level and how much?
2. Does the lever rub or touch any parts in such a manner as to cause binding, or to interfere with the normal action of the lever?
3. Knife-edges.—Same as main lever knife-edges.
4. Loops and Bearings.—Same as for reversing lever loop and bearings.
5. Nose-irons.—Same as for extension lever nose-irons.
6. Connecting rod.
 - a. Is the connection between the transverse extension lever and the shelf lever out of plumb? State how much and in which direction.
7. Anchorage of fulcrum.—Same as extension lever anchorage.

SCALE BRIDGE

1. Structural framework.
 - a. Are the longitudinal girders twisted from their proper vertical position, or do they show a tendency to twist under load?
 - b. If the girders are I-beams, are the settings so designed that the load is not centered over the web?
 - c. What is the state of corrosion—slight, advanced or excessive?
 - d. Does the structural steel in the bridge require repainting?
 - e. If wooden girders are used, are they spongy, decayed, etc., and do they deflect appreciably under load?

PIT

1. Drainage.
 - a. Is drainage unprovided or in poor condition?
 - b. Does the pit contain water? State how much.
 - c. Is the slope of the floor such that water is pocketed, or such that all the water will not run into the drain?
2. Ventilation.
 - a. Is the air in the pit, etc., such as to induce "cold sweating" or condensation of moisture on the metal parts of the scale?
3. Heating provision.
 - a. Is the heating provision, if any, unused or defective?
4. Accessibility.
 - a. Is it difficult to get in or out of the scale pit?
 - b. Is the scale pit dirty?
5. Lighting.
 - a. Is the pit unprovided with any regular means of furnishing light for making the inspections?

SHELF LEVER

1. Is the lever out of level and how much?
2. Does the lever rub or touch any parts in such a manner as to cause binding?
3. Knife-edges.—Same as for main lever knife-edges.
4. Loops and Bearings.—Same as a, b, c, d, f and g, for section loops.
5. Beam rod.
 - a. Is the connection between the shelf lever and the beam out of plumb? State how much and in which direction.
6. Fulcrum support.
 - a. Is the support of the fulcrum bearing loose or liable to deflect with load?

BEAM

1. Is the line of the movement of the poise out of level, when the beam is in the middle of the trig loop?
2. Does the beam rub or touch any parts in such a manner as to cause binding?
3. Knife-edges.—Same as for main lever knife-edges.
4. Loops and Bearings.—Same as for shelf lever loops.
5. Notches.
 - a. Are the notches worn or rusted?
 - b. Do the notches contain dust?
6. Poise.
 - a. Are any parts of the poise missing?
 - b. Does the latch of the poise engage imperfectly in the notches?
 - c. Does the poise run hard?
7. Counterpoise weights.
 - a. Are any of the counterpoise weights missing?
 - b. Are counterpoise weights of incorrect ratio used?
8. Support for beam.
 - a. Is the fulcrum bearing hanger or support insecure?
 - b. Is the shelf weak, out of level, or mounted on shaky frame or pillars?
 - c. Are the supports for the beam shelf carried on foundations other than the neck walls of the pit, or suitable connecting masonry?
 - d. Is the beam support weak enough to be shaken by the direct muscular effort of the inspector?
9. Housing of the beam.
 - a. Is the beam unprotected from the weather by any structure other than the beam box?
 - b. Is the beam housing located so that passing trains make it unsafe for a man to stand between the beam house and track on either side?
 - c. Is the arrangement of the beam house such that it is inconvenient or impossible for the weighmaster to see the car or full length of platform when he is stationed at the beam?

DECK

1. Live deck.
 - a. Does the deck contain excess coal, sand, grain or other material?
 - b. Does the deck touch any of the following parts so as to cause binding:
 1. Coping at sides and ends?
 2. Dead rail supports?
2. Rigid deck.
 - a. Does the deck touch any of the following parts so as to cause binding:
 1. Live rails?
 2. Live rail chairs?
 - b. Does a car on the dead rail cause any movement of the beam?
3. Live rails.
 - a. Is the gap between the live rails and the approach rails excessive? State the length of gap.
 - b. Do the live rails bind against the approach rails?
 - c. If easer or transfer rails are used, does binding occur?
 - d. Do the live rails deflect excessively when heavy loads are applied? State how much.
4. Dirt shields.
 - a. Are the dirt shields absent or out of order?
 - b. Do the dirt shields cause any binding?
 - c. Are the dirt shields of inadequate design, or material, such as belting, canvas, etc.?

APPROACHES

1. Foundation.
 - a. Are the approaches unsupported by wing-walls connecting with the pit?
 - b. Are the approach rails unprovided with any "anti-creeping" device?
 - c. Do any anti-creeping devices (if provided) appear to be ineffective?

- d. Are there any indications of derailments having occurred on the scale? (Note any scars or marks caused by the flanges of the wheels on the platform.)

A SCRAP STEEL BUILDING

THE Santa Fe Reclamation Plant at Corwith, Ill., has increased rapidly in size since its inception, as additional space and equipment have been found necessary with the extension of its activities. During the last season it was found necessary to provide a building for the housing of a 5-stand rolling mill, to be used in the reclamation of scrap materials. This necessitated a steel-frame, sheet-metal-covered structure of the usual type, but instead of securing this from a bridge shop, advan-



VIEW OF THE BUILDING DURING ERECTION

tage was taken of the fact that the steel from the old Santa Fe bridge across the Missouri river at Sibley, Mo., replaced in 1915, was stored in the yard. A design was prepared for the building which would permit the use of this material, which was then cut apart and reassembled in the form of roof trusses and columns for the building. The building is 180 ft. long by 65 ft. wide and consists of 22 trusses spanning the width of the building and supported on the columns, giving a clear height of 20 ft. About 100,000 lb. of steel was used in the roof trusses and 40,000 lb. in the columns.

PHOTOGRAPHING DRAWINGS

THE Chicago, Rock Island & Pacific has developed a system for photographing standard plans as a means of supplying the men in the field with handy copies of the various standards in which they are interested. The standard plans are 24 in. by 36 in., from which a photographic film is made 12 in. long and 8¼ in. wide. Blueprints of these films are issued to the men.

The prime requisite of the photo method is to obtain clear cut, fast printing negatives suitable for blue printing in an electric printing machine. This implies proper equipment for photographing. Any first-class view camera of sufficient size fitted with an anastigmat lens will serve the purpose. The camera is mounted on a table at a convenient distance from an illuminating box in which the tracing is mounted for photographing. The box used in the Rock Island office is designed to throw the proper amount of light evenly distributed on the tracing cloth during the exposure of the negative. Tracings are mounted on the back, while there is a sufficient opening in the front to permit the lens to cover the entire back when in proper focus. The inside of the box is painted a flat white and 10 100-watt Tungsten lamps are mounted around the opening in the front with reflectors placed to give as uniform illumination as possible.

Not only must the equipment be complete, but the work must be done intelligently and skillfully. Accurate focusing and properly timed exposures are especially impor-

tant, but with the exercise of care and a due amount of experience, the work can be done properly by the members of a drafting room force.

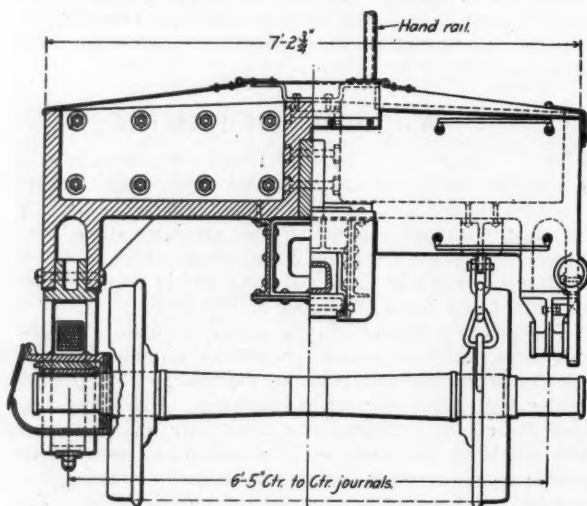
The economy of this work is largely dependent upon the amount of work to be done. On the Rock Island it was found that the saving on 500 film negatives from the cost to have them made by a professional photographer was sufficient to pay for the necessary equipment. Another large economy has come about through the saving in blue print paper, which is possible where the small size prints may be made from paper which would otherwise be wasted when making larger prints.

A NEW SCALE TESTING CAR

THE Louisville & Nashville has recently completed five scale testing cars, each of which is provided with an auxiliary car to afford living and working quarters for the scale testers while on the line. These cars have been assigned to scale testers, each of whom is responsible for the accuracy of the scales on a certain defined district of the railroad.

The scale cars are of the modern two-axle, short wheel-base type, and weigh 60,000 lb. The length of the body is 12 ft. 6½ in., the wheel base is 6 ft. 6 in., and the height from top of rail to top of the running board is 5 ft. 4¾ in. The car is entirely of iron and steel. The body consists of four box-shaped cast iron members which were accurately machined and drilled to be bolted together on the longitudinal and transverse center lines of the car. To insure good alinement and proper stiffness the body is reinforced along the longitudinal center line just above the steel center sill by a steel bar 12 in. high by 4 in. wide extending the entire length of the car and fitting into a recess formed by offsets in the adjoining faces of the cast iron sections.

These four cast iron boxes forming the body of the car are designed to hold 108 50-lb. weights. The car is



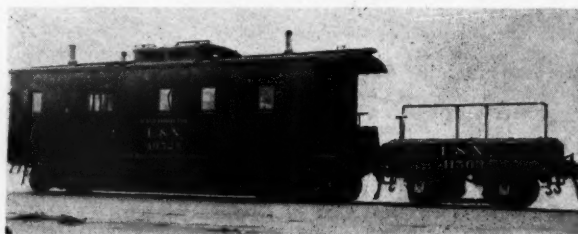
HALF SECTION AND HALF END VIEW

covered by a roof made of ¾ in. steel plates arranged to provide a running board along the longitudinal center line of the car and also to provide for trap doors opening into the compartments of the car body for the ready removal of the test weights.

The auxiliary or quarters car has the general appearance of a caboose except that there is a platform at only one end. The interior of the car is divided into three compartments, a kitchen and living room at the platform end, a bedroom in the middle, and a workshop

at the far end. The cars are supplied with all necessary appurtenances for the living quarters and the workshop is equipped with a work bench, a forge and anvil, a box for extra test weights and other tools and equipment of use to the inspector for making tests and minor repairs to scales.

These scale and auxiliary cars will be used by the inspectors in making regular trips over the assigned territory for the periodic inspection and test of all track scales of the railroad and also the track scales of private owners adjacent to the line in all cases where weights are accepted by the railroad for billing. By following a regular route it is anticipated that the inspectors can cover the territory every 60 to 90 days. In addition to the testing and inspection of these scales the inspectors are instructed to make all adjustments and repairs on company scales except when they are in need of a general overhauling. Inspectors are also required to examine and test all freight house and baggage scales



TEST CAR AND QUARTERS CAR

at least once each year. The condition of each scale tested is reported on a form designed for the purpose, one copy of each report going to the superintendent, one to the superintendent of machinery and one to the chief scale inspector. In the case of a scale of private ownership an additional copy is furnished to the owner.

Special instructions are given to the trainmen for the proper handling of this special equipment. These cars must always be hauled just in front of the caboose and on arrival at terminals must be set off where they will not be subjected to unnecessary switching. Under no circumstances are they to be handled in switching other cars in the train. These precautions are taken to reduce opportunities for injury to the cars and to allow the scale inspectors to obtain proper rest during lay-overs.

THE FALL CONVENTIONS

THE three associations in the maintenance of way field whose annual conventions are held during the fall—the Roadmasters' and Maintenance of Way Association, the American Railway Bridge and Building Association and the Maintenance of Way Master Painters' Association—are proceeding with their plans for their regular meetings this year. Because of the conditions now existing in this country, entertainment will be severely curtailed at all of these meetings and the sessions will be devoted strictly to the consideration of problems of particular importance to the departments represented at the present time. For this reason the meetings will be of more than usual value to the members in assisting them to solve the problems with which they are now being confronted.

THE ROADMASTERS' CONVENTION

The Roadmasters' convention will be held at the Auditorium Hotel, Chicago, September 18 to 20, inclusive. The program for this meeting was published in full in the last issue. From the interest expressed and the progress made in the preparation of committee reports and

papers the meeting promises to be one of the most valuable every conducted by this organization.

Equally promising indications are evident relative to the exhibit of the Track Supply Association, although the letters asking for reservations of space were not sent out until July 26. Forty-seven firms have already arranged to present exhibits and only a few spaces remain to be allotted. Among the firms which have already arranged to present exhibits are the following:

Ajax Forge Company, Chicago, Ill.
 Alexander Milburn & Co., Baltimore, Md.
 American Steel & Wire Co., Chicago, Ill.
 American Valve & Meter Co., Cincinnati, Ohio.
 American Hoist & Derrick Co., St. Paul, Minn.
 Anti-Creeper Corporation, New York, N. Y.
 Barrett Co., New York, N. Y.
 Bethlehem Steel Co., South Bethlehem, Pa.
 Carbic Mfg. Co., Duluth, Minn.
 Carnegie Steel Co., Pittsburgh, Pa.
 Chicago Railway Equipment Co., Chicago, Ill.
 Chicago Malleable Castings Co., Chicago, Ill.
 Cleveland Frog & Crossing Co., Cleveland, Ohio.
 Crerar Adams & Co., Chicago, Ill.
 Duff Mfg. Co., Pittsburgh, Pa.
 Fairbanks Morse & Co., Chicago, Ill.
 Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn.
 Hauck Manufacturing Company, New York, N. Y.
 Hayes Track Appliance Co., Richmond, Ind.
 R. W. Hunt & Co., Chicago, Ill.
 Ingersoll Rand Co., New York, N. Y.
 Indianapolis Brush & Broom Co., Indianapolis, Ind.
 Lackawanna Steel Co., Buffalo, N. Y.
 Madden Co., Chicago, Ill.
 Mudge & Co., Chicago, Ill.
 National Lock Washer Co., Newark, N. J.
 National Malleable Castings Co., Cleveland, Ohio.
 Pocket List of Railroad Officials, New York, N. Y.
 Positive Rail Anchor Co., Marion, Ind.
 P. & M. Co., Chicago, Ill.
 Q. & C. Co., New York, N. Y.
 Rail Joint Co., New York, N. Y.
 Railway Equipment & Publication Co., New York, N. Y.
 Railroad Supply Co., Chicago, Ill.
 Ramano Iron Works, Hillburn, N. Y.
 Reading Specialties Co., Reading, Pa.
 Henry Roos Foundry Co.
 Sellers Mfg. Co., Chicago, Ill.
 Simmons-Boardman Publishing Co., New York, N. Y.
 Simple Gas Engine Co.
 Southern Railway Supply & Equipment Co., St. Louis, Mo.
 Templeton-Kent Co., Chicago, Ill.
 Union Switch & Signal Co., Swissvale, Pa.
 Verona Tool Works, Pittsburgh, Pa.
 Walls Frogless Switch & Mfg. Co., Kansas City, Mo.
 Wm. Wharton, Jr. & Co., Inc., Easton, Pa.
 Wyoming Shovel Works, Wyoming, Pa.

THE BRIDGE AND BUILDING CONVENTION

The American Railway Bridge and Building Association has transferred its annual convention from St. Paul to Chicago and will hold it at the Hotel Sherman, on the date originally selected, October 16 to 18, inclusive. The program of this convention has been revised radically, so that more attention may be given to the labor and material problems. The Tuesday afternoon session will be devoted to the consideration of reports on economical methods of handling work under present conditions. The morning and afternoon sessions on Wednesday will be devoted to the consideration of the various phases of the labor and material problems, respectively. The program in detail is as follows:

TUESDAY MORNING, OCTOBER 16

- 10:00 a. m.—Convention called to order by president.
 Opening Business and Reports of Officers.
 11:00 a. m.—Committee Report, Economical Delivery of Water to Locomotives.

AFTERNOON SESSION

ECONOMICAL METHODS OF HANDLING WORK UNDER PRESENT CONDITIONS

- 2:00 p. m.—Committee Report—Erection of Plate Girder Spans with the Least Interruption to Traffic.

- 2:45 p. m.—Committee Report—Repairing and Strengthening Old Masonry.
 3:15 p. m.—Committee Report—Paint and Its Application to the Exterior of Railway Buildings.
 3:45 p. m.—Committee Report—Fireproofing the Roofs of Wooden Buildings.
 4:15 p. m.—Committee Report—Encasing Girder Bridges in Concrete.
 4:45 p. m.—A paper—Snow Sheds.

Tuesday evening has been set apart to pay tribute to the memory of Samuel F. Patterson, late secretary emeritus, the program being in charge of W. M. Camp.

WEDNESDAY MORNING, OCTOBER 17

THE LABOR PROBLEM

- 9:30 a. m.—Committee Report—How to Secure and Hold Bridge and Building Men.
 10:00 a. m.—Committee Report—Housing and Feeding Bridge and Building Maintenance Crews.
 10:30 a. m.—Committee Report—Uniform Rates of Pay Versus Differential Rates for Experienced Men.
 11:00 a. m.—Committee Report—Small Versus Large Gangs for Maintenance Work.
 11:30 a. m.—Committee Report—Labor-saving Equipment, Including Hand-operated Devices for Lifting, Pulling and Hoisting.

WEDNESDAY AFTERNOON

THE MATERIAL PROBLEM

- 2:00 p. m.—Committee Report—How Can We Best Meet the Present Bridge and Building Material Situation?
 (a) With Reference to Bridge and Structural Steel, by Albert F. Reichman, Division Engineer, American Bridge Co., Chicago.
 (b) With Reference to Building Materials.
 (c) With Reference to Water Service Materials, by C. R. Knowles, Superintendent of Water Service, Illinois Central.
 3:30 p. m.—Committee Report—Conserving the Supply of Materials by Intelligent Reclamation.
 4:00 p. m.—Committee Report—Shipping Company Materials Economically by Loading Cars to Capacity and Unloading and Releasing Them Promptly, Etc.
 4:30 p. m.—Committee Report—The Bridge and Building Material Yard.
 (a) As a Separate Organization.
 (b) As a Branch of the Stores Department.

THURSDAY MORNING, OCTOBER 18

- 9:30 a. m.—Call to Order.
 Unfinished and New Business.
 Election of Officers and Selection of Meeting Place for 1918.
 Adjournment.

The annual dinner will be held on Wednesday evening. On Thursday afternoon it is expected that a trip will be made to the plant of the American Bridge Company at Gary, Ind. The Bridge and Building Supply Men's Association will present an exhibit at the convention, as usual.

MASTER PAINTERS' ASSOCIATION

The Maintenance of Way Master Painters' Association will hold its annual convention at Cleveland, Ohio, on October 16 to 18, inclusive. A program is being prepared which will give special attention to those subjects which are of the most timely importance.

BETTER MEN FOR TRACK WORK

By C. H. CARPENTER

WE hear a great deal these days about the scarcity of good track men, both foremen and laborers. The railroads are unable to secure sufficient labor to maintain their roadways in the manner they should be maintained. While this is true, all over the country we find large industries, mills and factories with forces of good men, efficient workers, men that do not shift about from place to place, men that have passed mental and physical examinations and that come up to a high mark morally.

On our railroads we have many laborers that would not be taken into these industries. The railroads must take anything that comes along. Why do men flock to these other industries when the railroads are in dire need of good laborers and good foremen to handle labor? The answer is simple: The track man's wage has not kept pace with the wages of men in other lines.

Track maintenance is not what it was a few years ago. The track worker of to-day should be more intelligent than his predecessor. This is an age of specializing. The track man of to-day must be a specialist in his line. He must know the whys and wherefores of good and bad track. He must know what makes track defective and what makes it good. He must know how to handle men so as to get the most out of them. He must not be a driver of men, but a man of intelligence, a man who recognizes the merits of men under him, and who can pick out the most intelligent men and train them so that they can take his place if the time comes. The good foreman takes a deep interest in his work and keeps his men interested in their work. He teaches them to take pride in doing good work. A foreman should talk problems over with his men and discuss matters with them that tend to make them better and more efficient track men. He should keep posted on new things that come out in his line. He must know about such things as manganese switches and frogs, the latest designs of tie-plates, new track appliances, etc. To know all this he must be a man of intelligence, a man that studies and thinks and plans.

Good section foremen are valuable to a railroad, and are becoming more valuable as time passes. To obtain good foremen is a problem that should receive the best thought of our railroad managers to-day. There is only one place to get them. It is from the ranks, from the men who swing the hammer and shovel. How are we to get good men to make up the rank and file?

Is the track laborer of to-day worth more than he is paid? Perhaps as a whole he is not, but as a whole the track laborer comes far below the mark of what he should be. We often see track men working at a snail's pace and in a manner that a man with any get-up about him would be ashamed of. It is not to be inferred that all track men are of this sort, but there are more of this kind than there should be. The foreman cannot be too stern. He has to have men to keep up his track and he must take just what he can get under present conditions and do the best he can. In the neighboring industry the better paid workman must toe the mark or else he is no longer wanted. The problem has been worked out in many big plants all over the country. The better paid workman pays best in the long run.

There may be a reason why the railroads have not kept the track man's pay up to the standard that it should be. Perhaps in these over-regulated days they have not been able to pay the track man what he deserves, or perhaps another class of men have been receiving far more than is their just proportion, but this cannot last indefinitely. Raise the track man to a little higher plane than he now stands on. Give him a wage that will bring decent men to his ranks. Grant him the concessions that are granted men in other departments in the way of passes, prizes for especially good work, etc., and he will come up to the mark he should. In no other way will the track labor problem be solved.

CONVENTIONS.—President Wilson sees no sufficient reason for foregoing conventions. He believes that the application of this idea will be harmful rather than beneficial to the country.

THE MATERIAL MARKET

THE United States government is now the most active purchaser of track materials in the market. About the first of August an order was placed for 150,000 tons of 80-lb. rails for use in France at the current prices of \$38 and \$40. The angle bars were bought for 3.25 cents and the track bolts for 5.5 cents per pound. The rails are to be delivered as fast as they can be rolled, railway rollings being postponed until the government contracts are fulfilled. In consequence some of the roads are not receiving the season's rail according to schedule. A war order has also been placed for 75,000 kegs of track spikes at a price of \$4.50 per keg. Further orders of track material are anticipated. The government is now inquiring for 20,000 tons of 25-lb. rail. In the meantime the railroads are buying very little track material. One interesting development of the month was the reported purchase of rail in small quantities for emergency repair work by a number of railroads at prices of \$50 per ton and over. However, the standard prices remain as for some time in the past, at \$38 and \$40 per ton.

The prices on other track materials are still creeping up. Spikes are quoted at \$6.50 to \$7 per 100 lb. at Pittsburgh and \$4.25 to \$5.25 at Chicago, bolts at \$5.50 to \$8 at Pittsburgh and \$5.25 to \$6.50 at Chicago, tie plates are quoted at \$75 per ton, and angle bars at 3.75 cents to 4 cents per pound at Pittsburgh and 3.25 cents to 4 cents at Chicago. The price of nails remains at 4 cents per lb. in spite of the large orders. There is a great demand at the present time for boat spikes, which are selling at \$7 to \$8 per 100-lb. keg. Reinforcing bars are quoted at 5 cents per lb., an order of 2,700 tons of this material being recently placed for the extension of the Galveston causeway.

The reduced building operations and the almost entire suspension of bridge construction has caused a material reduction in the business of the bridge shops. Statistics of the Bridge Builders and Structural society for the month of July show contracts for 74,400 tons for that month, equivalent to 41½ per cent of the shop capacities of the country. A few minor contracts for railroad bridges have been awarded. The Chesapeake & Ohio has received bids for a bridge involving 600 tons.

Scrap is generally lower, the price of scrap rail being limited to \$39 or \$40 at most markets. Old frog and switch material brings \$29 to \$30 and angle bars \$30 to \$31. Relayers still command from \$50 to \$70. The drop in the price of scrap has caused quite a congestion of cars loaded with it, necessitating at least on embargo.

The lumber business remains good in spite of the falling off of the building operations, this being induced primarily by the heavy requirements for the government ship-building and cantonment construction. Building permits compiled by The American Contractor from 112 principal cities for the month of June, 1917, show a total value of \$61,278,000, as compared with \$95,964,000 for the same month last year, a decrease of 36 per cent. However, the production and shipments of lumber during the first six months of 1917 were larger than for the corresponding period in 1916 by 109,000,000 ft. b. m. Just at the present time the total shipments are exceeding the total production and in general the prevailing prices of lumber are being maintained.

The price of cement in carload lots, not including package, is \$1.91 at Chicago and Pittsburgh; \$2.04 at Cleveland, Indianapolis and Toledo; \$2.03 at Peoria and Milwaukee, and \$2.18 at St. Paul and Minneapolis. These prices have been maintained without change for a period of three months.

GENERAL NEWS DEPARTMENT

THE GULF COAST LINES have granted bonuses, amounting to about ten per cent, to employees not connected with labor unions. The bonus will be paid quarterly beginning October 1.

GOVERNOR BRUMBAUGH of Pennsylvania has vetoed the bill, passed several weeks ago by both houses of the legislature, to suspend the excess crew law of that state during the war.

THE CHICAGO, ROCK ISLAND & PACIFIC has made an increase of 10 per cent in the pay of all unorganized employees, effective July 16. It is estimated that between 3,000 and 4,000 employees are affected.

THE TENNESSEE LEGISLATURE passed a law at its last session which provides that drivers of automobiles shall stop within 50 ft. on approaching all railroad crossings unprotected by watchmen or gates and that they shall also look and listen before proceeding.

THE IDAHO LEGISLATURE has passed a law requiring railroads to destroy weeds on their right of way in accordance with orders issued by officers of the state or county. Another law in Idaho empowers the Public Utilities Commission, on receipt of a complaint and after hearing, to order gates, flagmen or automatic bells at highway crossings.

THE UNITED STATES CIVIL SERVICE COMMISSION announces examinations, September 5, for the positions of junior civil engineer and for junior architect, to fill places in the Division of Valuation of the Interstate Commerce Commission. Applicants must be between 21 and 36 years old, and the salaries are from \$1,200 to \$1,680.

THE SANTA FE LINES have arranged to finance the purchase of seed wheat for the coming season for farmers who have located on new lines of the system in southwestern Kansas, northwestern Texas and western Oklahoma. The railroad has deposited approximately \$250,000 with bankers in this region, who will lend the money to the farmers on notes due after the 1918 harvest.

THE STATE PUBLIC SERVICE COMMISSION of Washington has adopted a resolution setting forth that in its opinion the erection of new stations and the elimination of grade crossings is work that can be deferred until after the war, or for some time at least. In the resolution the commission also favors the curtailment of passenger service so that the men and money may be used in other lines.

THE CONNECTICUT LEGISLATURE has passed a law authorizing railways to clear the brush off from unimproved lands adjacent to their rights of way within 100 ft. of the track. This right must be exercised under the direction of the State forest fire warden, and, under suitable restrictions. Inflammable substances may be burnt on the premises under the supervision of the town fire warden.

THE NINE RAILWAY REGIMENTS organized under the direction of S. M. Felton, president of the Chicago Great Western, were recently renamed and renumbered, ten having been added to each of the former numbers. For example, the regiment until recently stationed at Chicago and formerly known as the Third Reserve Engineers, is now the Thirteenth Engineers (Railways), United States Army.

THE UNITED STATES WAR DEPARTMENT has placed orders for 1,064 locomotives, 6,000 30-ton, standard gage, and 2,997 narrow gage (1 ft. 11½ in.) freight cars in addition to 150,000 tons of rails for service with the United States troops in France. The first locomotive was completed on August 11, twenty days after the order was placed. The Baldwin Locomotive Company is now turning these engines out at the rate of four a day.

THE LEHIGH VALLEY has just put to work a section gang of women on its main line. Nine women working under the direction of an experienced foreman comprise the gang, which operates on the west end of the Buffalo division near this city. The women are performing all the regular duties of similar gangs

of men, tightening bolts, putting in new ties, and tamping ballast. Pneumatic ballast tampers are used by the Lehigh Valley.

SAMUEL M. FELTON, president of the Chicago Great Western and heretofore adviser to General Black, chief of engineers of the United States Army, has been appointed director general of railways by the Secretary of War, and will have his office at Washington, D. C. According to the order announcing his appointment, Mr. Felton is charged under the chief of engineers with the organization and despatch abroad of all railway forces and the purchase of all railway material, both for initial action and for continuous supplies for operation.

THE INTERSTATE COMMERCE COMMISSION has issued a supplement to its rules governing the classification of steam railway employees, providing that until further order railways may be relieved from the requirement of recording and reporting the number of hours on duty, among others, of the maintenance of way and structures foremen, section and other foremen, crossing flagmen and gatemen, drawbridge operators and all other employees. Instead they may record and report the number of days served by these classes of employees.

THE CHICAGO & NORTH WESTERN, to preserve the pension rights of employees, has instructed the head of each department to advise the secretary of the pension board of the names of employees entering the service, together with their positions and the dates when they leave railroad service. When a former employee is discharged from military service and returns to the railroad the head of his department will be required to advise the secretary of the pension board promptly of the absentee's name, the date of his re-entering the service and the position he holds.

THE SOUTHERN PACIFIC, through W. R. Scott, vice-president and general manager, has issued a statement that it will be forced to discontinue some of its trains within a short time unless the federal government opens up oil fields in the West which have been reserved on the theory that a navy to be built five years from now may need this supply. It is stated that the consumption of crude oil in California is now 60,000 gallons a day above production and that the Southern Pacific is now using from 9,000 to 12,000 barrels a day more than it can buy or produce.

THE PENNSYLVANIA RAILROAD has decided to suspend temporarily its rule, heretofore in force, prohibiting the hiring of new employees above the age of 45 years in any branch of the service. Under the new rule, which has been adopted to meet war conditions, persons between the ages of 45 and 70 years may be employed during the war and for a period of six months thereafter. Such employment is not to be considered permanent and will not carry with it the privileges of the pension department. Numbers of former employees have already been taken into the service.

THE COMMISSION ON CAR SERVICE has reported to the Railroad's War Board that orders have been given since May 1 for the movement of 106,033 empty freight cars to other railroads and that many of these cars have already been received by the roads needing them. Of the cars recently ordered out 7,800 will go to grain country, 5,000 to the South for watermelons, and hundreds are going to lumber mills. The Car Service Commission is doing this under the authority given it by the War Board on April 26 to relocate freight equipment and to so regulate car supply as conditions make necessary.

THE CAR SHORTAGE on August 1 was 33,776 or only one-fourth as great as that on May 1, when the excess of unfilled car requisitions was 148,627. This remarkable showing has been made in spite of the fact that the railways are now supplying from 15 to 20 per cent more freight service with the same number of cars than was being given at this time last year. The movement of cantonment supplies alone is now requiring the full services of more than 30,000 cars. In addition there is extraordinarily heavy demand for cars to transport food products and materials to and from munition factories.

PERSONAL MENTION

GENERAL

THOMAS J. QUIGLEY, roadmaster on the Illinois Central, with headquarters at McComb, Miss., has been appointed trainmaster vice John L. Beven.

C. R. MORRILL, who has been appointed assistant general manager of the Southern Pacific at Houston, Tex., was born at St. Louis, Mo., on October 12, 1869, and entered railway service with the Southern Pacific as a rodman in April, 1892. He served successively until 1897 as a chainman, draftsman and instrumentman. On the latter date he became roadmaster, and four years later was promoted to division engineer. In July, 1904, he became assistant superintendent, and in January, 1915, was promoted to division superintendent, with headquarters at Houston.

JOHN J. PELLEY, who has been appointed general superintendent of the southern lines of the Illinois Central, with headquarters at New Orleans, La., entered the service of the Illinois Central as a track apprentice on August 29, 1900. He was appointed supervisor on the Indiana division on November 1, 1905, and was promoted to roadmaster on the Louisiana division on January 15, 1908. He was appointed division superintendent on the Tennessee division on May 10, 1912, since which time he has been in the operating department, his most recent position having been that of superintendent on the Yazoo & Mississippi Valley at Memphis, Tenn.

JOSEPH H. GUMBES, who has recently been appointed general superintendent of the Western Pennsylvania division of the Pennsylvania Railroad, with headquarters at Pittsburgh, received most of his training in the maintenance of way department. He was born November 27, 1866, and graduated from the University of Pennsylvania in 1888, entering railway service as a rodman on the Pennsylvania the same year. In 1890, he was transferred to the maintenance of way department at Altoona, Pa., and in 1891 he was promoted to assistant supervisor at Freeport. He was later transferred to Mifflin, Pa., in the same capacity. In 1897 he was promoted to supervisor at Millersburg, Pa., later being transferred to other divisions as supervisor. In 1903 he was promoted to division engineer of the Monongahela division, in 1905 was transferred to the West Jersey & Seashore division and in 1907 was again transferred as division engineer to the Pittsburgh division. In 1911 he was promoted to assistant superintendent of this division and in 1913 was promoted to superintendent of the Renovo division with headquarters at Renovo, Pa. He was transferred to the Philadelphia Terminal division in 1916, which position he held at the time of his recent appointment noted above.

RICHARD L. O'DONNELL, general superintendent of the Western Pennsylvania division of the Pennsylvania Railroad, who has been appointed assistant general manager, with headquarters at Philadelphia, Pa., received his early railroad training in the maintenance work. He was born at Philadelphia on November 5, 1860, and graduated from Polytechnic College, Philadelphia, in 1882. He entered railway service with the Cornwall & Lebanon as a rodman in 1882. In 1883 he entered the service of the Pennsylvania in a similar capacity and later served successively as levelman and transitman in the construction department until 1884, when he became draftsman in the assistant engineer's office at Blairsville, Pa. In 1886 he was promoted to assistant engineer in the principal assistant engineer's office at Altoona and in March of the following year became assistant supervisor. In November, 1889, he was promoted to supervisor at Altoona and in April, 1891, he became assistant engineer of the Tyrone division. In 1897 he was promoted to assistant superintendent of the Pittsburgh division and in 1902 to superintendent. In January, 1903, he was transferred to the Buffalo & Allegheny division at Buffalo, N. Y., and in March, 1911, became general superintendent of the Western Pennsylvania division with headquarters at Pittsburgh.

ENGINEERING

L. C. FROHMAN has been appointed principal assistant engineer of the Florida East Coast with headquarters at St. Augustine, Fla.

W. D. FAUCETTE, chief engineer of the Seaboard Air Line at Norfolk, Va., has had his authority extended over the Tampa & Gulf Coast.

W. C. HAWKINS has been appointed engineer maintenance of way of the Coal & Coke Railway, with headquarters at Gas-saway, W. Va., succeeding F. D. Cosner, who has resigned to engage in other business.

J. M. GRANT has been appointed engineer maintenance of way on the Chicago, Peoria & St. Louis, with headquarters at Springfield, Ill., succeeding E. A. Froyd, who has been commissioned a captain in the United States Army.

LLOYD W. GREENE has been appointed assistant engineer in the maintenance of way department on the Mohawk division of the New York Central, with headquarters at Albany, N. Y., succeeding W. W. Griffiths, transferred to the valuation department.

J. H. BARBER, resident engineer of the Canadian Pacific at West Toronto, Ont., has been appointed engineer in charge of double tracking at North Toronto. H. R. H. SILCOX has been appointed resident engineer of the Toronto terminals, succeeding Mr. Barker, both appointments being temporary.

F. J. PARRISH, division engineer of the Cincinnati, Hamilton & Dayton at Dayton, Ohio, has been made division engineer of the C. H. & D. lines, now comprising the Toledo division of the Northwest district of the Baltimore & Ohio, with headquarters at Dayton. H. G. SNYDER and W. P. BALL have been appointed assistant division engineers, with the same headquarters.

W. G. COUGHLIN, engineer maintenance of way of the Pennsylvania Railroad, has had his authority extended over the New York, Philadelphia & Norfolk at Philadelphia. The same order applies also to C. H. NIEMEYER, assistant engineer maintenance of way in charge of roadway and track at Philadelphia; G. C. KOONS, assistant engineer maintenance of way in charge of bridges and structures at Philadelphia, and J. C. AUTEN, principal assistant engineer at Wilmington, Del.

H. S. ROGERS, maintenance engineer of the Delaware & Hudson at Albany, N. Y., has been appointed division engineer in charge of maintenance of way forces on the Susquehanna division, with headquarters at Oneonta, N. Y.; F. C. HOHN has been appointed division engineer on the Pennsylvania division with headquarters at Carbondale, Pa., and G. D. HUGHEY has been appointed division engineer on the Champlain division with headquarters at Plattsburg, N. Y. J. C. DORSEY, roadmaster at Saratoga Springs, N. Y., has been appointed division engineer on the Saratoga division with headquarters at Albany. The position of roadmaster, Saratoga and Champlain division, is abolished.

T. J. SKILLMAN, division engineer of the Monongahela division of the Pennsylvania Railroad at Pittsburgh, Pa., has been appointed division engineer in the office of the principal assistant engineer of the New Jersey division with headquarters at New York city. W. F. GREENE, division engineer of the Delaware division at Wilmington, Del., has been transferred to the Monongahela division, succeeding Mr. Skillman. S. L. CHURCH, supervisor at Lancaster, Pa., has been promoted to division engineer of the Delaware division with headquarters at Wilmington, Del., succeeding W. F. Greene. S. H. KUHN, supervisor at Norristown, Pa., has been transferred to the office of the valuation engineer at Philadelphia, Pa.

ARTHUR N. DAVIDSON, who was recently appointed principal assistant to the district engineer maintenance of way on the Baltimore & Ohio Southwestern at Cincinnati, Ohio, was born at Tippecanoe on November 2, 1880, and was educated at Denison University. He entered railway service with the Baltimore & Ohio at Cleveland in May, 1899, and later served successively until October 10, 1906, as carpenter, axeman, levelman, chainman and transitman. On June 1, 1907, he was transitman on the Florida East Coast, and four months later he became field engineer for the Wood Harmon Company at Pittsburgh, Pa. On June 1, 1909, he was made deputy county engineer at Newark,

N. J., and on June 1, 1910, he became assistant engineer on the Baltimore & Ohio at St. George, S. I., N. Y. On March 1, 1913, he was appointed district bridge inspector on the Cincinnati, Hamilton & Dayton at Cincinnati, after which he served consecutively as division bridge inspector at Indianapolis, Ind., and at Dayton, Ohio, and assistant engineer at Dayton. On September 1, 1916, he was promoted to assistant division engineer, which position he held until his recent appointment as principal assistant to the district engineer maintenance of way on the Baltimore & Ohio Southwestern.

N. C. VAN NATTA, who has been appointed chief engineer of the Missouri, Oklahoma & Gulf, with headquarters at Muskogee, Okla., was born at Chicago on May 8, 1868, and entered railway service with the Chicago, Burlington & Quincy in 1887. In 1909 he became associated with the Gallatin Valley as chief engineer and in 1910 was appointed engineer on the Chicago, Rock Island & Pacific. In April, 1912, he became assistant engineer on the Chicago, Milwaukee & St. Paul and in the following year went with the Chicago & Eastern Illinois in a similar capacity. In 1916 he was promoted to locating engineer and in 1917 became valuation engineer for the Missouri, Oklahoma & Gulf, which position he held until his recent appointment as chief engineer.

S. L. CHURCH, supervisor on the Pennsylvania Railroad, with headquarters at Lancaster, Pa., who has been appointed division engineer on the Delaware division of the Philadelphia, Baltimore & Washington, as announced elsewhere, entered the service of the Pennsylvania Railroad at Buffalo, N. Y., on July 8, 1903, as transitman in the office of the principal assistant engineer. In August, 1905, he was transferred to Altoona, Pa., and in May, 1906, was made assistant supervisor of the Sunbury and Lewiston division at Wilkes-Barre, Pa. In April, 1909, he was transferred to the New York division, and in November, 1912, he was promoted to supervisor in the office of assistant to the general manager at Philadelphia, Pa. In December, 1913, he was made supervisor of the Monongahela division at Dravosburg, Pa., and in September, 1916, he was transferred to Lancaster, Pa.

A. V. REDMOND has been appointed division engineer of the Canadian Government Railways, with headquarters at Cochrane, Ont., succeeding W. A. Cowan, who has been promoted to the position of general superintendent, as noted elsewhere. Mr. Redmond was graduated from Queens University, Kingston, Ont., in 1903, taking a position in charge of concrete construction on the Grand Trunk Pacific. In 1904 he became a levelman, being promoted subsequently to transitman and engineer in charge of surveys. In 1908 he was resident engineer on the construction of the Canyon City pipe line at Canyon City, Colo. Later in that year he became resident engineer of construction on the National Transcontinental Railway, becoming division engineer in the following year, a position which he held until 1915. He became resident engineer at Cochrane on the Canadian Government Railways in June, 1916, becoming acting division engineer in October of that year. From April, 1917, to May he was resident engineer, which position he held until he was promoted to division engineer.

TRACK

R. W. WOODBURY has been appointed superintendent of roadway shops of the Southern with headquarters at Chattanooga, Tenn., vice R. E. Weedon, resigned to accept service elsewhere.

T. W. WHITNEY, formerly in railway service with the Erie at Susquehanna, Pa., and with the Lehigh Valley at Sayre, Pa., has been appointed track supervisor on the Erie at Stroudsburg, Pa.

RICHARD J. VAUGHN, roadmaster on the Union Pacific at Evanston, Wyo., has been appointed general roadmaster on the Nebraska division, with headquarters at Omaha, Neb., succeeding Thomas Scott, resigned.

J. R. WATT, roadmaster of the Louisville & Nashville at Nashville, Tenn., has been promoted to general roadmaster, with headquarters at Louisville, Ky., succeeding Thomas Maney, resigned. D. E. BEATTY, roadmaster at Paris, Tenn., has been transferred to Nashville, succeeding J. R. Watt, and J. E. LOCKHART, assistant engineer at Paris, Tenn., has been ap-

pointed roadmaster, succeeding Mr. Beatty, with the same headquarters.

JOHN McDUGALL, assistant roadmaster on the Northern Pacific at Laurel, Mont., has been appointed acting roadmaster of the Montana division, with headquarters at Livingston, succeeding E. M. Riton, deceased. W. E. FITZSIMONS has been appointed roadmaster on the Fargo division, with headquarters at Dilworth, Minn., succeeding F. J. Challoner, effective August 7.

J. H. RIGBY, assistant roadmaster of the Knoxville division of the Southern with headquarters at Knoxville, Tenn., has been appointed roadmaster of the Asheville division with headquarters at Asheville, N. C., vice B. M. Smith, assigned to other duties. N. W. MOORE, supervisor of the Knoxville division, has been appointed assistant roadmaster at Knoxville, Tenn., succeeding Mr. Rigby.

G. S. CRITES, assistant division engineer on the Baltimore & Ohio at Flora, Ill., has been promoted to inspector of the standard track work system, with headquarters at Cincinnati, Ohio. C. S. ROZZELLE, assistant supervisor at Blanchester, Ohio, has been promoted to assistant division engineer at Flora. M. H. BEARD, general foreman at Chicago Junction, Ohio, has been appointed assistant supervisor at Blanchester, Ohio. C. A. NUNES has been appointed general yard foreman at Chicago Junction, Ohio.

JAMES HEVERS, roadmaster on the Delaware & Hudson at Green Ridge, Pa., has been transferred to the Pennsylvania division, where he will have charge of the Carbondale yard and all lines south, vice W. H. Koch, transferred. The position of roadmaster over the entire Pennsylvania division has been abolished. M. J. NUGENT, roadmaster at Odeonta, N. Y., has been appointed track inspector on the Delaware & Hudson with headquarters at Albany. The position of roadmaster of the Susquehanna division is also abolished.

JOHN M. FARROW, whose appointment as roadmaster on the Norfolk & Western, with headquarters at Norfolk, Va., was announced in the *Railway Maintenance Engineer* for August, was born at Lafayette, Va., on November 11, 1868, and entered railway service in the bridge and building department of the Norfolk & Western on September 1, 1889. In March, 1892, he was transferred from the Radford division to the Shenandoah division as assistant carpenter foreman. In March, 1902, he was promoted to carpenter foreman, which position he held until his appointment as roadmaster on the Durham district.

PATRICK H. ANSBRO, who was appointed roadmaster of the Third district of the Salt Lake division of the Denver & Rio Grande, with headquarters at Thistle, Utah, on August 1, was born in Ireland on February 10, 1868, and entered railway service with the Atchison, Topeka & Santa Fe on April 1, 1884, as a section and yard foreman. In 1894 he became yard foreman on the Missouri Pacific, and three years later entered the service of the Colorado Midland in a similar capacity, later being promoted to roadmaster. In 1907 he became yard foreman on the Denver & Rio Grande, and later was promoted to roadmaster on the Third division at Delta, Colo., which position he held until his recent transfer.

J. KAPOUIAN, section foreman on the Great Northern, has been appointed assistant roadmaster on the Breckenridge division, with headquarters at Casselton, N. D., succeeding E. Roessler, resigned. M. J. KELLIHER has been appointed assistant roadmaster on the Butte division, with headquarters at Great Falls, Mont., succeeding John Wallin, resigned. J. E. VAUGHN, section foreman, has been appointed assistant roadmaster of the Havre division, with headquarters at Great Falls, succeeding C. A. Nunes, resigned. J. E. CAMPBELL has been appointed assistant roadmaster on the Cascade division, with headquarters at Tye, Wash., succeeding H. C. Coulton, who has been assigned to other duties. CALVIN HANKINS, section foreman, has been appointed assistant roadmaster of the Butte division, succeeding A. Ekstrom, resigned. JAMES SULLIVAN has been appointed assistant roadmaster of the Montana division, with headquarters at Fairview, Mont., succeeding A. J. Ryan, resigned. HANS YSETH, section foreman, has been appointed assistant roadmaster of the Sioux City division, with headquarters at Sioux City, Ia., succeeding August Newberg, resigned.

BRIDGE

A. O. MYRON, carpenter foreman on the Great Northern, has been appointed master carpenter of the Kalispell division, succeeding F. W. Barrington, with headquarters at Whitefish, Mont.

S. E. DUFORT, who has been appointed supervisor of bridges and buildings on the Southern division of the Boston & Maine at Concord, N. H., succeeding A. I. Gauthier, on military leave, entered the employ of the Boston & Maine as a bridgeman in 1889. He has since served as foreman, bridgeman, bridge inspector and division foreman, and effective June 16 was appointed supervisor of bridges and buildings, as noted above.

A. J. HOWERTON, bridge foreman on the Kentucky division of the Illinois Central, with headquarters at Princeton, Ky., has been promoted to supervisor of bridges and buildings at Freeport, Ill., succeeding R. J. McKee, who was killed recently as a result of being struck by a train at Wallace yard, west of Freeport. Mr. Howerton was born at Central City, Ky., on May 8, 1872, and entered railroad service in April, 1897, as a bridge laborer with the Illinois Central. From 1898 to 1900, he was bridge carpenter on the same road and from 1900 to 1902 was assistant foreman. From the latter date to 1917 he was bridge and building foreman on the Illinois Central.

OBITUARY

GEORGE S. CHEYNEY, general superintendent of water companies of the Pennsylvania Railroad, died suddenly of heart failure on August 16 at his home in Cheyney, Pa. Mr. Cheyney was born on July 5, 1863, and began railway work in the auditor's office of the Philadelphia & West Chester. He later assisted in surveying the route of the Philadelphia & Newtown. He next entered the service of the Philadelphia Water Company on reservoir construction and was afterward in the maintenance of way department of the Fremont, Elkhorn & Missouri Valley in Nebraska. Subsequently he took a government contract for surveying in the Black Hills, and then entered the engineering department of the Williamsport & North Branch, afterward becoming engineer of maintenance of way of the Indiana, Decatur & Western. On August 1, 1903, he became hydraulic engineer of the Springfield Water Company and the American Pipe & Construction Company, and in March, 1910, he entered the service of the Pennsylvania Railroad as general superintendent of water companies, which position he held until his death, as noted above.

IN MILITARY SERVICE

C. S. COE, engineer maintenance of way of the Florida East Coast, with headquarters at St. Augustine, Fla., has resigned to enter military service and his former position has been abolished.

F. A. WRIGHT, supervisor on the Nashville, Chattanooga & St. Louis, at Bridgeport, Ala., has received a commission as lieutenant in the Engineer Officers' Reserve Corps, but has not yet been ordered to report for active duty.

B. W. GUPPY, engineer of structures on the Boston & Maine with headquarters at Boston, Mass., has received a commission as Major in the United States Army and has been assigned to the First Battalion, Fourth Reserve Engineers, at Camp Rockingham, Salem, N. H.

JOHN LAWRENCE MAHER, assistant engineer in the office of the district engineer maintenance of way, Northwest district, of the Baltimore & Ohio, Cincinnati, O., has been commissioned a captain in the Officers' Reserve Corps, U. S. A., and is waiting instructions from the adjutant general to report.

D. C. RHYSBURGER, assistant engineer in the valuation department of the Chicago, Milwaukee & St. Paul at Chicago, has been commissioned captain in the Engineer Officers' Reserve Corps, and has been assigned to Ft. Leavenworth, Kan. PHILLIP R. ELFSTROM, assistant engineer at Chicago, and C. H. POOLE, assistant engineer at Milwaukee, Wis., have been commissioned first lieutenants in the Engineer Officers' Reserve Corps. Lieut. Poole has been assigned to Ft. Leavenworth. C. U. SMITH, assistant engineer at Milwaukee, is a captain in the First Battalion, Engineers, Wisconsin National Guard, and is stationed at Camp Robinson, Wis.

CONSTRUCTION NEWS

THE ATCHISON, TOPEKA & SANTA FE has prepared preliminary plans for a terminal at Tulsa, Okla.

This road also is preparing preliminary plans for the construction of a two-story brick headhouse 36 ft. by 70 ft. and a frame freight house 36 ft. by 200 ft. at Newton, Kan.

This company plans to construct a freight transfer station at Kansas City, Kan., which will be of frame construction, 30 ft. by 1,000 ft., with about 400 ft. of platforms. Part of the building will be two stories high and the upper floor will be used to house the office force.

This road has plans completed for a second track between Floyd, Mo., and Camden, a distance of approximately 5 miles, between Braddock, Kans., and Walton, a distance of 6 miles; from Goff, Cal., to Bagdad, a distance of 30 miles, and from Glorieta, N. M., to Fox, a distance of about 4 miles. Work has already been started on the work in California.

THE CANADIAN PACIFIC plans to build a three-span reinforced concrete bridge at London street, Windsor, Ont., which will consist of three 35-ft. spans with reinforced concrete abutments, piers and deck.

THE CHESAPEAKE & OHIO NORTHERN was opened for traffic on July 30, from the connection with the main line of the Chesapeake & Ohio at Edgington, Ky., north to Waverly, Ohio, 30 miles. The work included the construction of a steel bridge 3,450 ft. long over the Ohio river at Sciotoville, and a steel viaduct 1,080 ft. long over the Little Scioto river, two miles north of Sciotoville.

THE CHICAGO, ROCK ISLAND & PACIFIC has prepared preliminary plans for the construction of a subway under its tracks at Moline, Ill.

THE DULUTH, MISSABE & NORTHERN has completed plans for the double tracking of its line between Virginia, Minn., and Wolf, a distance of approximately 10 miles. In connection with this project the road will also build additional yard tracks. The total cost of improvements will be about \$150,000.

THE GALESBURG, ROCKFORD & NORTHERN has been granted a certificate of convenience and necessity by the Illinois Public Utilities Commission for the purchase of the Hooppole, Yorktown & Tampico, and the extension of this line from Hooppole to a point on the Chicago, Rock Island & Pacific at Geneseo, a distance of approximately 12 miles.

THE GRAND TRUNK has awarded a contract to James Stewart & Co., New York, for the construction of a car repair shop at Port Huron, Mich. The building will be 22 ft. high, 77 ft. wide and 360 ft. long, with brick walls, concrete foundation and a tar and gravel roof.

THE GREAT NORTHERN plans to construct a bridge 1,600 ft. long over the Musselshell river at Weede, Mont., but does not expect to carry out the work in the immediate future.

THE HILLSBORO, CYNTHIANA, BAINBRIDGE & CHILLICOTHE (Electric) is contemplating the construction of a road between Hillsboro, Ohio, and Chillicothe, a distance of 42 miles.

THE IBERIA, ST. MARY & EASTERN has completed plans for the construction of an extension from Shadyside, La., to Patterson, a distance of eight miles. Grading has been started and all material is on the ground. The line is expected to be ready for operation by the early part of November.

THE ILLINOIS CENTRAL has awarded a contract to the Railroad, Water & Coal Handling Company, Chicago, Ill., for the construction of a 500-ton coaling station of the automatic bucket type at Lambert, Miss. The structure will have a concrete foundation and timber superstructure. A contract was also awarded to the same company for the construction of a similar station of 300-ton capacity at Durant, Miss.

This company has completed plans for the construction of the brick freight house at Grand Crossing (Chicago). The structure

will be 30 ft. by 200 ft., with wood block floor and slate roof, and will cost approximately \$70,000.

This road has completed plans for an addition to the passenger station at Paducah, Ky. The extension will be 56 ft. by 22 ft., of brick construction, with a slate roof, and will contain a lunch room and kitchen. The plans also provide for the installation of toilet facilities in the depot and the construction of a plain canopy with composition roof, averaging about 30 ft. in width, around the building, which will be about 250 ft. long. The work will cost about \$10,000.

The road has also awarded a contract to George B. Swift & Co. for the construction of a freight house at Kankakee, Ill., to cost about \$20,000. The building will be 37 ft. by 128 ft., 60 ft. of which will be two stories in height. The structure will have brick walls, a slate roof and wood block floors.

This company has awarded a contract to T. S. Leake & Co., Chicago, for the enlargement of mechanical facilities at Clinton, Ill.

The railway has also awarded a contract to W. J. Vitterell, Webster City, Ia., for the construction of a freight house at Ft. Dodge, Iowa, to cost about \$25,000.

The road has awarded a contract to Kehn Bros., Chicago, for the installation of heating facilities at the Burnside (Chicago) shops, to cost about \$5,000.

THE KANSAS CITY TERMINAL RAILWAY is making preliminary plans for the construction of two passenger stations in Kansas City, Kan., and expects to start construction this summer so that the stations will be ready for service next spring. Details of the plans are not available at present, but the estimated cost of each station, with its approaches and platforms, will be approximately \$100,000.

THE KIRBY-BONNER LUMBER COMPANY has completed plans for the construction of a road from Newton, Tex., to a point 24 miles northeast. The contract for the work will probably be let within a few days and construction will be started as soon as possible.

THE LEHIGH & NEW ENGLAND has awarded a contract to F. H. Clement & Co., Philadelphia, Pa., to build a line from Bethlehem, Pa., 4.82 miles in a generally westerly direction to Allentown and East Allentown with an intermediate terminal at Rittersville and a spur from Rittersville 0.61 miles long. The line is to be built through a rolling country, the approximate cut per mile will be 36,000 cu. yd., approximate fill 47,000 cu. yd., the maximum grade will be 1.5 per cent and the maximum curvature 10 degrees. There will be five reinforced concrete bridges at highway crossings.

NEW MEXICAN INTERESTS are contemplating the construction of the railroad from Holbrook, N. M., 70 miles south into a timber belt lying in the government forest preserve.

THE MIDLAND & NORTHWESTERN is erecting a depot at Midland, Tex., to cost about \$5,500. The work is being done by C. K. Stark. The grading for the road, which will extend from Midland, Tex., to Seminole, 65 miles, has been completed and 48 miles of track has been laid. It is the intention ultimately to extend the line from Seminole to Roswell, N. M., 130 miles further.

THE MISSOURI PACIFIC has awarded a contract to J. J. Ball, Little Rock, Ark., for grading the four miles of track from the main line of the Central division to the cantonment site at Fort Logan H. Roots near Little Rock, and for the construction of four additional miles of track on the cantonment grounds. The track laying will be done by company forces. These improvements, together with a shelter, will cost \$100,000. The government also is building about five miles of track within the camp grounds. The railroad is also laying additional side tracks at Jefferson Barracks, Mo., at a cost of about \$9,000.

THE MISSOURI, KANSAS & TEXAS has awarded a contract to L. J. Smith Construction Company, Kansas City, Mo., for grading in connection with the extension of yards at Parsons, Kans., which will involve the handling of 275,000 cu. yd. of earth.

THE NEVADA-CALIFORNIA-OREGON is erecting an office building, a roundhouse, a machine shop and minor buildings at Alturas, Cal., the cost of which, including real estate and necessary trackage, will aggregate about \$75,000.

THE NEW YORK, NEW HAVEN & HARTFORD has received bids for widening the present two-track South Boston cut to accommodate four tracks between South Bay Junction and the Boston freight terminal, a distance of about 2,500 ft. Eleven overhead steel bridges will also be constructed, 10 of which will be about 60 ft. long and one 70 ft. long. A new automatic electric pumping plant will also be installed. Contracts have not yet been awarded.

This road is building a new yard between New Haven, Conn., and North Haven, with company forces. In addition to the track work five steel bridges varying in length from 25 ft. to 200 ft. will be built and also some general yard buildings. The grading will be heavy.

This company has also recently started the construction of a large new gravity classification yard at Cedar Hill (New Haven), Conn., which will include a 25-track eastbound and a 15-track westbound classification yards in addition to receiving and departure yards. An engine terminal, including a 16-stall round house, will be provided. The grades of the passenger and freight lines will be separated at the entrances to the yard. A 400-car merchandise transfer station will also be built at this point for the consolidation of merchandise traffic.

THE OREGON SHORT LINE plans to build 11 miles of road east of Idaho Falls, Idaho. The construction will be divided into two lines, one from Idaho Falls to a point 4 miles south and the other from Firth to a point 7 miles north.

THE OSAGE COUNTY & SANTA FE has awarded a contract to Maney Brothers & Co., Oklahoma City, Okla., for the grading, bridge work, track laying and surfacing, fencing and buildings necessary in the construction of the line from Bowen to Fairfax.

THE PACIFIC ELECTRIC has been granted a franchise to extend its line from Santa Ana, Cal., to Tustin, a distance of approximately 6 miles. Work on the extension will be started in the near future.

THE PEARL RIVER VALLEY has been chartered to build a railroad from Picayune, Miss., to Columbia, approximately 55 miles, the entire distance being through virgin timber lands.

THE PENNSYLVANIA-DETROIT RAILROAD has awarded a contract to the W. S. Newkall Company, Detroit, Mich., for 325,000 cu. yd. of grading and 6,750 cu. yd. of concrete masonry for a classification yard at Detroit.

This road has awarded a contract to Iliff Brothers, London, Ohio, for the construction of a bridge over the Huron river at a point two miles above Flat Rock, Mich. The bridge will be of reinforced concrete, and will have three 14-ft. spans.

THE PENNSYLVANIA LINES WEST have awarded a contract to P. T. Clifford & Son, Valparaiso, Ind., to construct a third track between Trimmer Junction, Ind., and Boone, a distance of 6.4 miles. The work will involve a change in grade extending over a distance of two miles and the building of six small bridges. The work has already been started, and will cost approximately \$625,000.

This company is building a new yard at Orrville, Ohio, which involves the laying of about 30,000 ft. of track.

THE PENNSYLVANIA RAILROAD is building a reinforced concrete bridge to carry two tracks over the new location of Manatawny creek at Pottstown, Pa., with company forces. The work will cost about \$33,437. The course of Manatawny creek will be changed by the Eastern Steel Company to pass under the bridge in its new location.

This company has awarded a contract to Arthur McMullen, New York, to build the entire bridge line from Camden, N. J., to Petty's Island.

THE PHILADELPHIA & READING has awarded a contract to C. P. Bower, Reading, Pa., for grading at Saucon Creek, near South Bethlehem, Pa., for an extension to a freight yard north of Saucon Creek, providing for 385 more cars and for a new yard south of Saucon Creek, with a capacity of 850 cars. The road will also build an engine house which for the present will provide for but 6 engines, but it is planned to ultimately take care of 29 engines. A coaling station, water station and ash pit will also be constructed.

THE ST. LOUIS-SAN FRANCISCO has completed plans for a station at Oklahoma City, Okla., which will cost approximately \$300,000. The building will be of reinforced concrete construction with cut stone and brick exterior, two stories high, 139 ft. wide and 146 ft. long. Bids for the work will be opened on September 15. Inquiries should be addressed to Lebenbaum, Marx & Vigeant, architects, Chicago.

THE ST. PAUL UNION DEPOT COMPANY has awarded a contract to Morris, Sheppard & Dougherty, St. Paul, Minn., and the George J. Grant Construction Company, acting as one corporation, for the construction of the new St. Paul passenger terminal. The contract covers the construction of the headhouse, the grading for the elevation of passenger tracks, the building of retaining walls, the relocating of tracks, etc. The estimated cost of the project is \$4,500,000, and the work is being done on a cost plus percentage basis. Work has already been started, and it is expected that the headhouse will be finished in December, 1918.

THE SALT LAKE, GARFIELD & WESTERN has completed plans for the electrification of its line and work on the project has already been started. The approximate cost of the work will be \$250,000.

THE SOUTHERN has awarded a contract to Thomas Worthington, Birmingham, Ala., to construct a reinforced concrete viaduct over the tracks of the Southern, the Seaboard Air Line and the Louisville & Nashville at Twenty-first street, Birmingham. The new structure will be 80 ft. wide, and will replace the present wooden structure. It is planned to start work at an early date.

This road is laying 25,331 ft. of track to afford a connection with its main line and to supply other facilities for handling the movement of men and materials at Camp Greene, near Charlotte, N. C. The work involves 125,000 cu. yd. of excavation and will provide trackage for accommodating 399 cars.

THE SOUTHERN PACIFIC is rehabilitating a portion of one of its car shops at Sacramento, Cal., which was lately injured by fire. The work will cost approximately \$30,000.

THE TEXAS & PACIFIC plans to construct an eight-stall roundhouse at Texarkana, Tex.

THE TOLEDO, ST. LOUIS & WESTERN has completed plans for the construction of a freight house and for an extension to its office building at Frankfort, Ind. The freight house will be a frame building 26 ft. by 140 ft., the east 40 ft. of which will be two stories high. This company is also planning to construct a six-stall engine house and machine shop 40 ft. by 75 ft., a one-story freight house 25 ft. by 100 ft. and a concrete-lined reservoir of 500,000 gal. capacity at Charleston, Ill.

THE UNION PACIFIC plans to double track its line from Manhattan, Kan., to Junction City, a distance of 20 miles, to improve transportation facilities to Fort Riley. The company has already put in new stations and freight sidings and has enlarged the present facilities at a cost of approximately \$50,000.

THE YAZOO & MISSISSIPPI VALLEY has awarded a contract to the George B. Swift Company, Chicago, for the construction of a passenger station and power house at Greenwood, Miss. The station will be one story high, 42 ft. wide and 161 ft. long, of brick construction with concrete foundation and slate and composition roof. The power house will be 26 by 54 ft. and also will be of brick construction. The improvements necessitate the removal and remodeling of the freight house, which work will be done by the company's forces.

STRUCTURAL STEEL

THE ANN ARBOR is in the market for 1,500 kegs of spikes for delivery for the first half of 1918, and is also inquiring for 300,000 tie plates for 1917 delivery.

THE MISSOURI PACIFIC has ordered 180 tons of steel from the American Bridge Company for a riveted truss span at Sweet Springs, Mo.

THE UNITED STATES GOVERNMENT has issued an inquiry for 20,000 tons of 25-lb. rail for use in France.

THE UNITED STATES GOVERNMENT has placed orders for 150,000 tons of rails and 75,000 kegs of track spikes for use in France.

THE WABASH is inquiring for tie plates for 1918 delivery.

SUPPLY TRADE NEWS

PERSONAL

HOWARD C. MULL, sales representative of the Verona Tool works, in the Chicago office, has been appointed sales agent in charge of the Chicago territory.

W. T. KELLEY has been appointed representative in the railroad sales department of the Barrett Company, New York, with headquarters at Pittsburgh, Pa.

WILLIAM H. ROSS has become sales engineer in the railway sales department of the Patton Paint Company, Milwaukee, Wis., with headquarters at Pittsburgh, Pa.

THE NATIONAL TUBE COMPANY sold its Kewanee plant, located at Kewanee, Ill., on August 1, to the Walworth Manufacturing Company, Boston, Mass., and on that date the National Tube Company retired from the fittings business.

J. H. JOWETT of the Ingersoll-Rand Company, New York City, was elected vice-president, and L. D. Albin, assistant general sales manager, has been appointed general sales manager, succeeding Mr. Jowett. Mr. Jowett and Mr. Albin will continue to make their headquarters at New York.

ADRIAN D. JOYCE, general manager sales and distribution of the Sherwin-Williams Company, has been appointed by the Federal War Industries Board to membership on a special committee for the standardization of paints and varnishes in connection with war purchases. On the committee with Mr. Joyce are six other prominent paint manufacturers of the country.

JESSE HOUGH, sales representative of the National Lock Washer Company, died at his home in Indianapolis, Ind., on July 23, after a seven months' illness. Mr. Hough had been associated with the National Lock Washer Company since January, 1913, and for 10 years prior to that time was storekeeper in the maintenance of way department of the Indianapolis Traction & Terminal Company.

WALTER R. MORRIS has recently been appointed assistant traffic manager of the American Steel Export Company, with headquarters in the Woolworth building, New York City. Because of suspended service of American-Hawaiian steamers via Panama Canal for an indefinite period, Mr. Morris resigned his position as assistant traffic manager of the American-Hawaiian Steamship Company to accept employment with the American Steel Export Company.

GENERAL

THE ROBERTS & SCHAEFER COMPANY, Chicago, has been awarded contracts for the construction of a 150-ton, two-track, reinforced concrete, automatic electric coaling plant for the Elgin, Joliet & Eastern at Joliet, Ill.; a 100-ton coaling plant equipped with a duplex shallow pit loader and a "RandS" measuring coal loader on the Chicago Short Line at Chicago; two 150-ton, three-track, reinforced concrete, automatic coaling and sanding plants for the Oregon Short Line at Dillon, Mont., and Melrose; a 500-ton, three-track, reinforced concrete coaling station for the Pennsylvania Lines at the new Hawthorne yards, Indianapolis, Ind.; a 100-ton automatic coaling station for the Pennsylvania Railroad at Rochester, N. Y.; a 400-ton, two-track coaling station for the Texas & Pacific at Mingus, Tex., and a four-pit cinder handling plant for the Pittsburgh & Lake Erie at Haselton, Ohio.

TRADE PUBLICATIONS

THOR TOOLS.—The Independent Pneumatic Tool Company, Chicago, Ill., has issued a folder giving data on the various classes of pneumatic hammers, pneumatic drills and electric drills manufactured by that company. Various classes of these drills and hammers are shown in illustrations.

BRINELL HARDNESS TESTING MACHINE.—The Scientific Materials Company, Pittsburgh, has issued a 12-page pamphlet describing the improved American model of the Brinell Hardness Testing Machine with the new appliance for measuring the depth of the penetration as well as other apparatus used in testing.

this advertisement shocks you

because it contains no capital letters. it is opposed to the laws of english grammar as man has decreed it shall be written. but why stick to conventionalities when by abandoning them one can drive home a point that will make a lasting impression? what if it does jar a bit?

now the point is, there are a lot of manufacturers of things which railroads buy who do not advertise. take wire fencing—a common commodity. did you ever stop to think that the railways of the united states and canada alone buy a total of 343,200,000 feet a year?

and there are many other common-place articles that are bought by railroads in huge quantities—bolts, nuts, screws, nails, spikes, bar iron, sheet steel, lumber.

the sales of each and every one of these things can be influenced by advertising if you talk to the railway officer in his own language. let us submit a practical demonstration of how to interest the "billion dollar customer" in your product. you can't get at him right through any medium whose circulation is not concentrated on railway subjects.

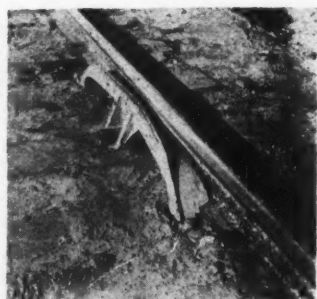
simmons-boardman publishing co.

new york:
woolworth bldg.

chicago:
transportation bldg.

cleveland:
citizens bldg.

washington:
home life bldg.



Note the foot guard and the wearing insert. Weight 80 lbs.

Tailor Made GUARD RAILS

To suit your special requirements,
for less money than you are now paying.

WRITE FOR CATALOGUE

National Steel Products Co., Inc.
Ensley, Alabama

A Balanced Paper

Have you ever studied the Railway Maintenance Engineer to see how thoroughly it covers its field? Special attention is given to the balancing of each issue to see that every branch of the Maintenance of Way Department is given its proper attention and space. The editors have continually before them the necessity of presenting in each issue information which will be of direct value to readers interested in the different phases of this work. This is what is making the Railway Maintenance Engineer such an important factor in the affairs of this department.

FROGS = SWITCHES = STANDS

Manganese and Built-Up Construction

IN STOCK for IMMEDIATE SHIPMENT

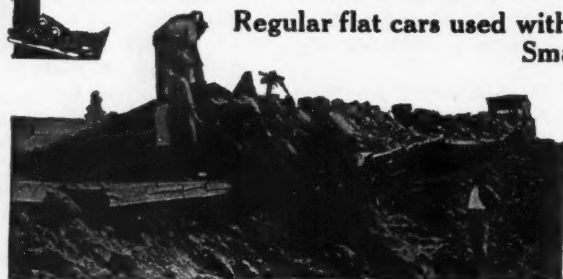
THE INDIANAPOLIS SWITCH & FROG COMPANY

NEW YORK

SPRINGFIELD, OHIO

CHICAGO

LIDGERWOOD RAPID UNLOADER



Regular flat cars used with this method, reducing dead weight haulage.
Smaller crews required.

Load can all be dumped in one place.
Load can be spread along any distance.
Cars unloaded at lowest cost.

Send for Bulletin

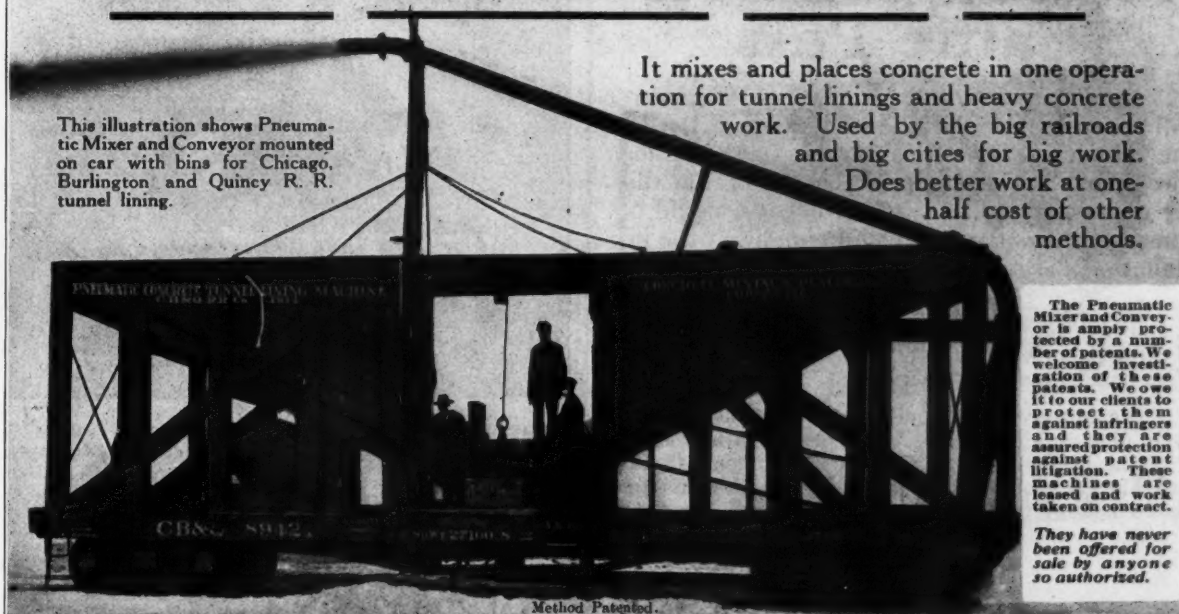
Hoists for Every Railroad Service

Lidgerwood Mfg. Co. ⁹⁶Liberty Street New York
Philadelphia Pittsburgh Chicago Los Angeles Seattle

Shoot Concrete With Air

This illustration shows Pneumatic Mixer and Conveyor mounted on car with bins for Chicago, Burlington and Quincy R. R. tunnel lining.

It mixes and places concrete in one operation for tunnel linings and heavy concrete work. Used by the big railroads and big cities for big work. Does better work at one-half cost of other methods.



The Pneumatic Mixer and Conveyor is amply protected by a number of patents. We welcome investigation of these patents. We owe it to our clients to protect them against infringers and they are assured protection against patent litigation. These machines are leased and work taken on contract.

They have never been offered for sale by anyone so authorized.

Method Patented.

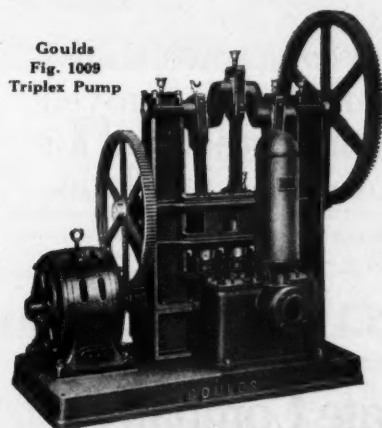
Concrete Mixing & Placing Co., 123 W. Madison St., Chicago
"The Compressed Air Method"

For General Water Supply Service, Boiler Feeding, Tank Pumping
 and Other Pumping Services
 Use

GOULDS PUMPS

FOR EVERY SERVICE

They are the acknowledged standard both in quality and design and are guaranteed to satisfactorily perform the work for which we recommend them.



Goulds
 Fig. 1009
 Triplex Pump

Fig. 1009. Single-Acting Triplex Pump

This pump is one of our standard types and is very widely used for all the above services.

It is made in 13 different sizes with capacities ranging from 2 to 350 gallons per minute, for pressures up to 150 lbs.

This pump is furnished for gear connection to motor or engine or with tight and loose pulleys for belt drive.

Write for complete set of Goulds Bulletins, showing all our types of triplex, centrifugal, vacuum and rotary pumps.

THE GOULDS MANUFACTURING COMPANY

Branch Houses:
 BOSTON, NEW YORK,
 PHILADELPHIA, CHICAGO.

Main Office and Works:
 Seneca Falls, N. Y.

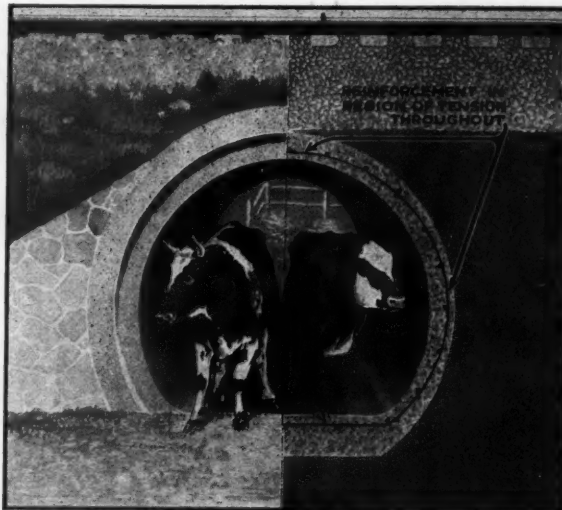
District Offices:
 PITTSBURGH, ATLANTA,
 BALTIMORE, HOUSTON.

Massey Concrete Cattle Pass

Here's a point of superiority you engineers will recognize—only in the Massey cattle pass is the reinforcing placed in the region of tension throughout. The cross-section illustrates this big advantage. The strength it adds should be considered when you are contemplating the installation of cattle passes.

The Massey cattle pass is made up at our factories in units 6' long, 84" wide by 72" high inside. Two head of cattle pass through side by side. A flat bottom gives them broader footing.

The Massey pass is built to carry the dead load in deep fills, and live loads when placed within about 3' of the base of the rail. It is more economical than any other type of structure, and requires absolutely no maintenance.



Massey factories make concrete culvert pipe, 12" to 84" in diameter, concrete bridge slabs, piles, and portable concrete houses. Our plant locations and large stock of standard products enable us to make prompt deliveries at low freight rates.

Get Massey Service with Your Cattle Pass

C. F. MASSEY COMPANY

NEW YORK
NORFOLK

KANSAS CITY

Peoples Gas Building
CHICAGO

MINNEAPOLIS

SPOKANE
DALLAS

Factories Located at

Newark, N. J.
Chicago, Ill.

Memphis, Tenn.
Anna, Ill.

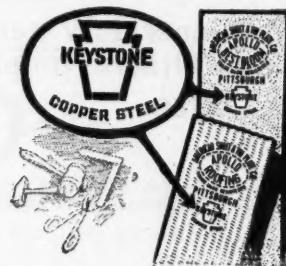
Youngstown, Ohio
Los Angeles, Cal.

Kansas City, Mo.
Meridian, Miss.

Minneapolis, Minn.
Spokane, Wash.

Dallas, Tex.
Chatham, Ont., Can.

A Reputation for Reliability—



has followed *Keystone Copper Steel* ever since it was first placed upon the market. Its excellence was proved in actual service before we offered this alloy material for Black and Galvanized Sheets and Roofing Tin Plates.

Apollo-Keystone Galvanized is without a peer for Culverts, Tanks, Flumes, Roofing, Etc.

Look for the special Keystone mark added to regular brands. Shall we send Keystone booklets showing series of interesting weather tests?

American Sheet and Tin Plate Company

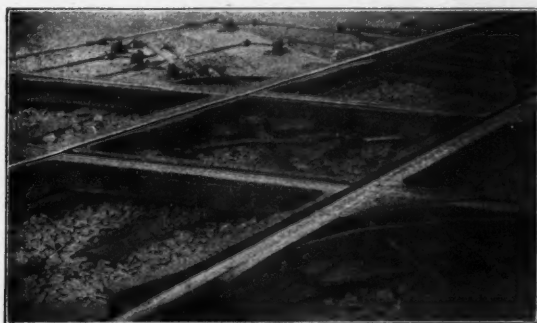
GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis
Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York City
Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

Advertising Defined

"Advertising is intensive salesmanship. It is the modern method of scientific, economic distribution, and anything which tends to facilitate distribution—the most serious problem of merchandising—is not and cannot be extravagance, any more than a machine which costs \$5,000, but pays for itself in a year, could be considered a waste." Excerpt—Who Pays the Advertising Bills.



The Real Test

of a crossing is its ability not only to stand up under all conditions of service at a low maintenance cost, but also at the same time to stay in such condition that an early renewal will not be necessary. Several years' continuous service show that the

Eymon Continuous Crossing

fulfills the above conditions. It provides smooth rails and eliminates the cause of the pound. It reduces the maintenance costs—it does not get out of alignment and provides greater safety to both rails and equipment. Write for the facts.

Eymon Continuous Crossing Co.
MARION, OHIO.



"IMPERIAL" TIE TAMPERS

Save 75% Labor in Tamping Track

There are other advantages:

Track is more uniformly tamped.

Track is more permanently stable.

Any kind of ballast is tamped effectively.

Tampers may be operated by ordinary labor.

Bulletin 9023 tells the complete story. Send for it.

INGERSOLL-RAND COMPANY

11 Broadway, New York

165 Q. Victoria St., London

Offices the World Over

Western Equipment Saves Man Power

Not One Man and Not One Day

must be wasted during the coming months of army mobilization, which will test American railroads as they never were tested before.

The old-time method of ditching and filling by using shovelers or unloading plows **Wastes Both Man Power and Time**. It also wastes money and boosts maintenance costs.



Western Air Dump Cars

meet the need of the hour. They dump instantaneously. They dump automatically. They dodge the traffic. For trestle filling and similar maintenance work, they are indispensable.

For ditching, couple your ditcher between two Western Air Dump Cars. The saving will be gratifying in first cost; in operating cost; in time; in man power.

Stop The Waste

WESTERN WHEELED SCRAPER CO.

USERS

Many of the most prominent railroads of the country, some of which are the following:

A. T. & S. F. R. R.
A. C. L.
Canton R. R.
C. B. & Q. R. R.
Cuba R. R.
C. H. & D. R. R.
C. P. R. R.
C. M. & P. S. R. R.
C. M. & S. P. R. R.
D. & S. L. R. R.
G. T. P. R. R.
Isthmian Canal
I. C. R. R.
K. C. T. R. R.
L. & N. R. R.
L. H. & S. L. R. R.
M. K. & T. R. R.
M. & O. R. R.
M. C. R. R.
N. Y. C. & H. R. R.
N. Y. C. & St. L. R. R.
N. Y. N. H. & H. R. R.
N. & W. R. R.
O. W. R. R. & N.
Panama R. R.
Pennsylvania R. R.
P. E. R. R.
Q. O. & K. C. R. R.
S. L. S. W. R. R.
Serbian Gov't R. R.
S. A. L.
Virginian R. R.

Aurora, Ill.



Marion

*Steam Shovels, Dredges, Draglines
and Kindred Machinery*

WHEN someone says "See America First" you immediately think of the Great Northern Railway; in just the same way do the officials of that famous system think "Marion" in connection with the terms "Ditching Machines," "Steam Shovels," or any kind of "Excavating Machinery."

For the Great Northern Railway and The Marion Steam Shovel Company are business friends in the strictest sense;—

**Marion Ditchers and Marion Shovels
Do "Great Northern's" Big Work**

and small work, too—whether it's constructing new lines or opening up ditches along existing rights-of-way.

May we suggest that an investigation might develop just as interesting possibilities for using "Marions" in your own work? We should heartily welcome that, and will gladly assist you in making it. Your request for particulars will not obligate you.

The Marion Steam Shovel Company, Marion, Ohio
Branches: Atlanta, Chicago, New York, Philadelphia, San Francisco, Seattle
225 ESTABLISHED 1884



Right There—

is where its strength lies. Right at the center of the joint—where most joints are weak—the Bonzano-Thomson possesses its greatest strength. The reason is in the vertical depending flange. Built like a bridge girder, it fulfills the fundamental law of beam design—the strength varying directly as the square of the depth.

This strength factor, together with the Thomson patent of metal distribution throughout the vertical section, makes the Bonzano-Thomson Rail Joint.

"The Joint as Strong as the Rail"

Write for complete information

The Q^{AND} C Co.

New York St. Louis
90 West St. Ry. Exch. Bldg.
Chicago
Peoples Gas Bldg.

Q^{AND} C



Short Length Units—Long Length Service



Installation of National Lock-Joint Cast-Iron Culvert Pipe under a fill 40 feet high and 38 feet wide at top, on the P. R. R. System.



Forty-two inch National Lock-Joint Cast-Iron Culvert Pipe under a fill 45 feet high and 42 feet wide at the top, on the P. R. R. System.

Solves Your Culvert Renewal Problem

Savings in first cost, freight, handling, waste, overweight, combined with assured long satisfactory service, such are the factors which have caused over forty important trunk lines not only to *install*, but in many cases *standardize* on

National Lock-Joint Cast-Iron Pipe

As Permanent As Your Road Bed

The engineers of those roads have found from experience that in the "National" they have a culvert material as near ideal as possible, and secure economies, which, before its use, they did not consider possible.

Made in short lengths, 3, 4 and 5 ft., "National" pipe can be, and on these forty-odd roads is, installed by ordinary section gangs, without accessory tool of any kind, or the slightest interference with traffic.

No piles to drive, no fills to remove, no tunneling. Rethread the old culvert and back fill with concrete, that's all, *except big economies and long, satisfactory service.*

No wonder over forty railroad systems have adopted the "National Lock Joint" Standard as the solution of their Culvert Renewal Problem.

CATALOGUE AND PRICES ON REQUEST



AMERICAN CASTING CO. Birmingham, Ala.

Chicago Office - Peoples Gas Building
New England Representative
Fred A. Houdlette & Son - Boston, Mass.
St. Louis Representative
H. P. Webb - Wainwright Building
St. Paul Office
Contractor's Supply and Equipment Co.
Philadelphia Representative
Geo. H. Grone - Suite 700, Widener Bldg.
Blair & Co., Bankers Investment Co.
San Francisco, Cal.



*Are You Saving
Your Money To
Invest In The
Next Issue Of
The Liberty Loan
?*



